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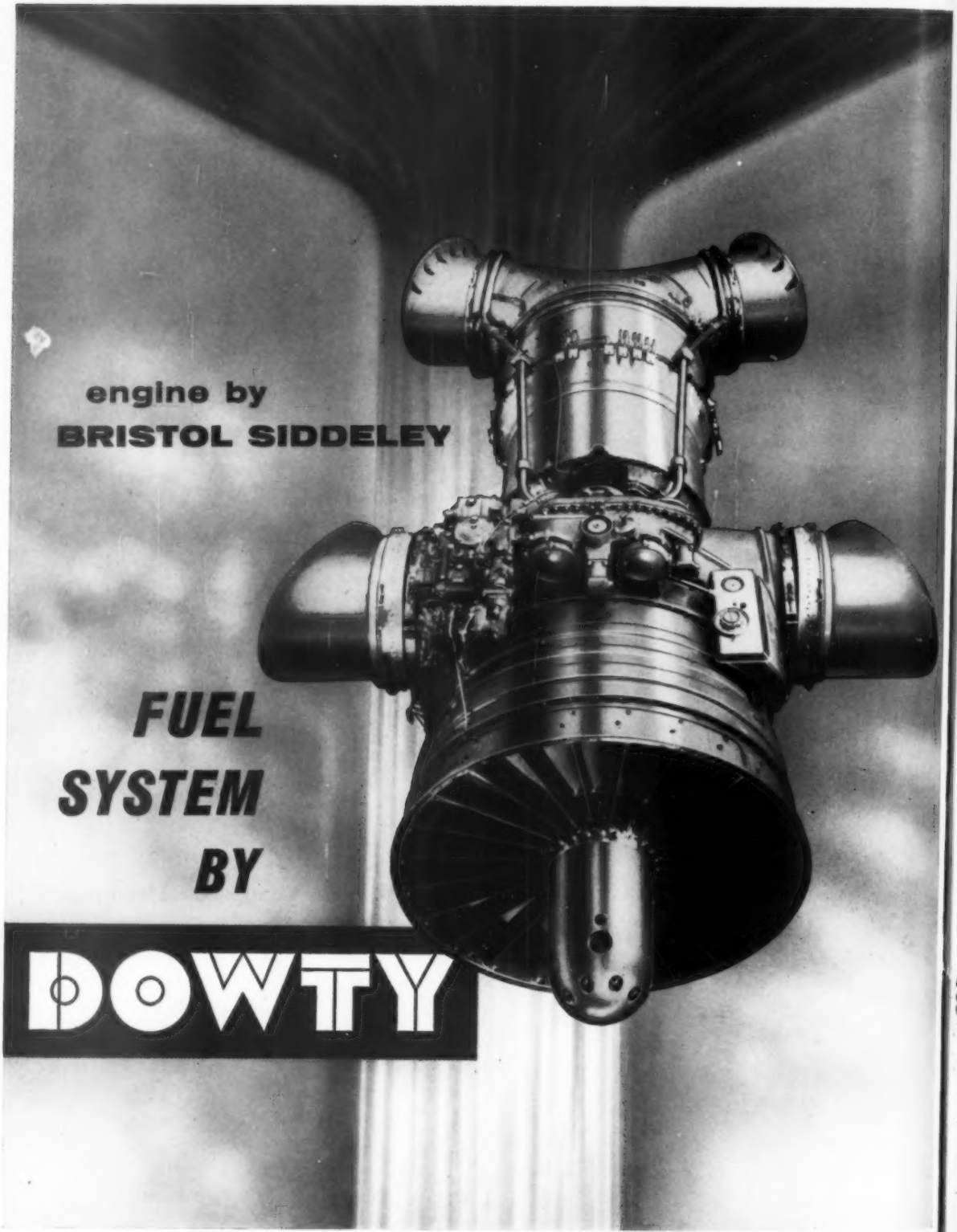

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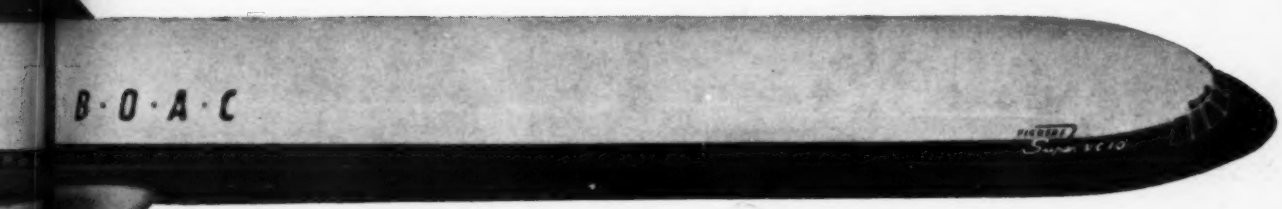

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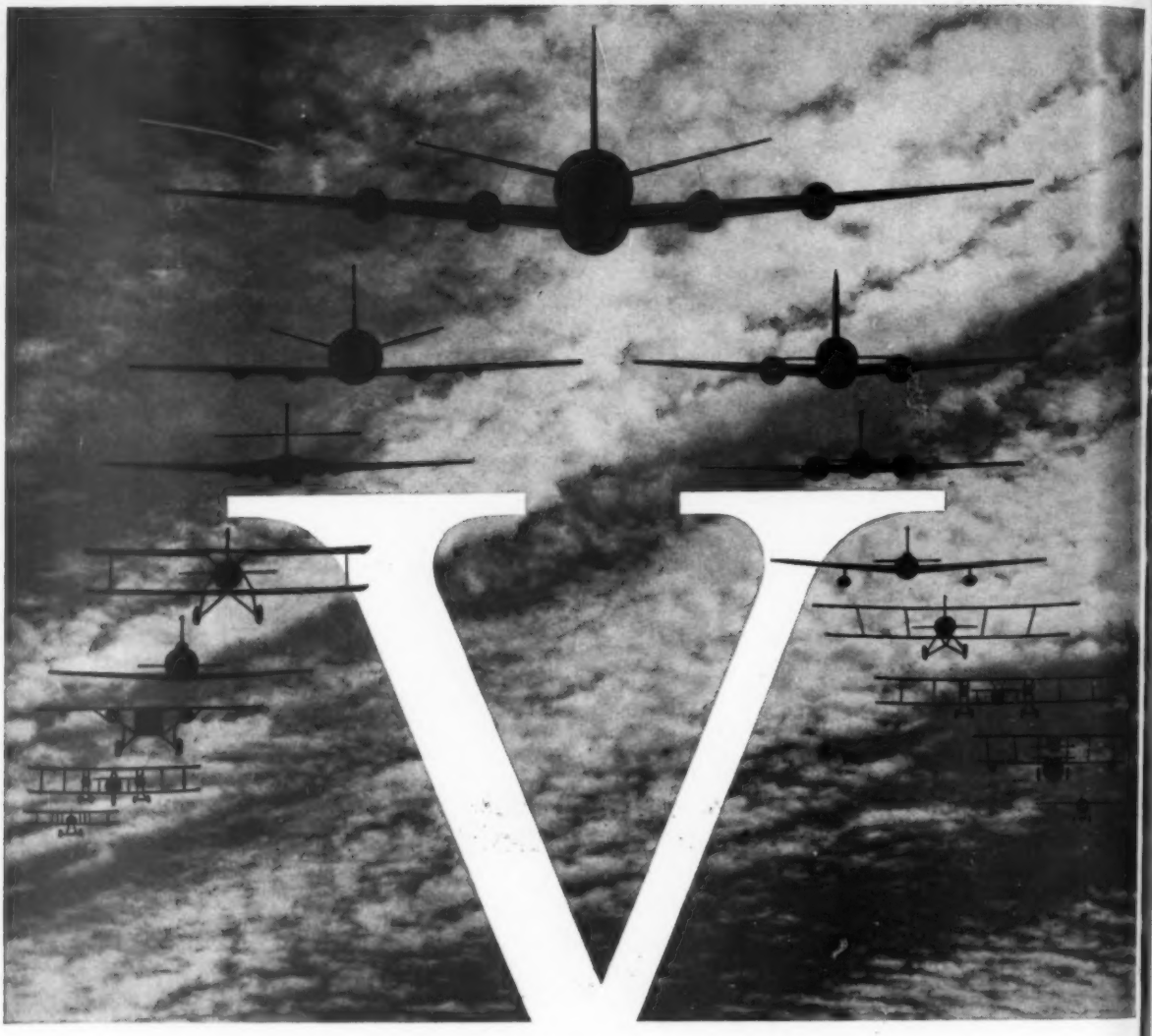

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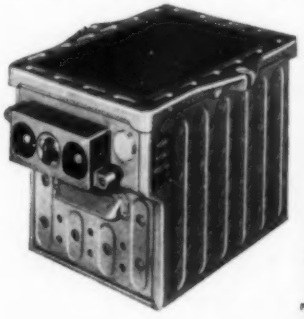

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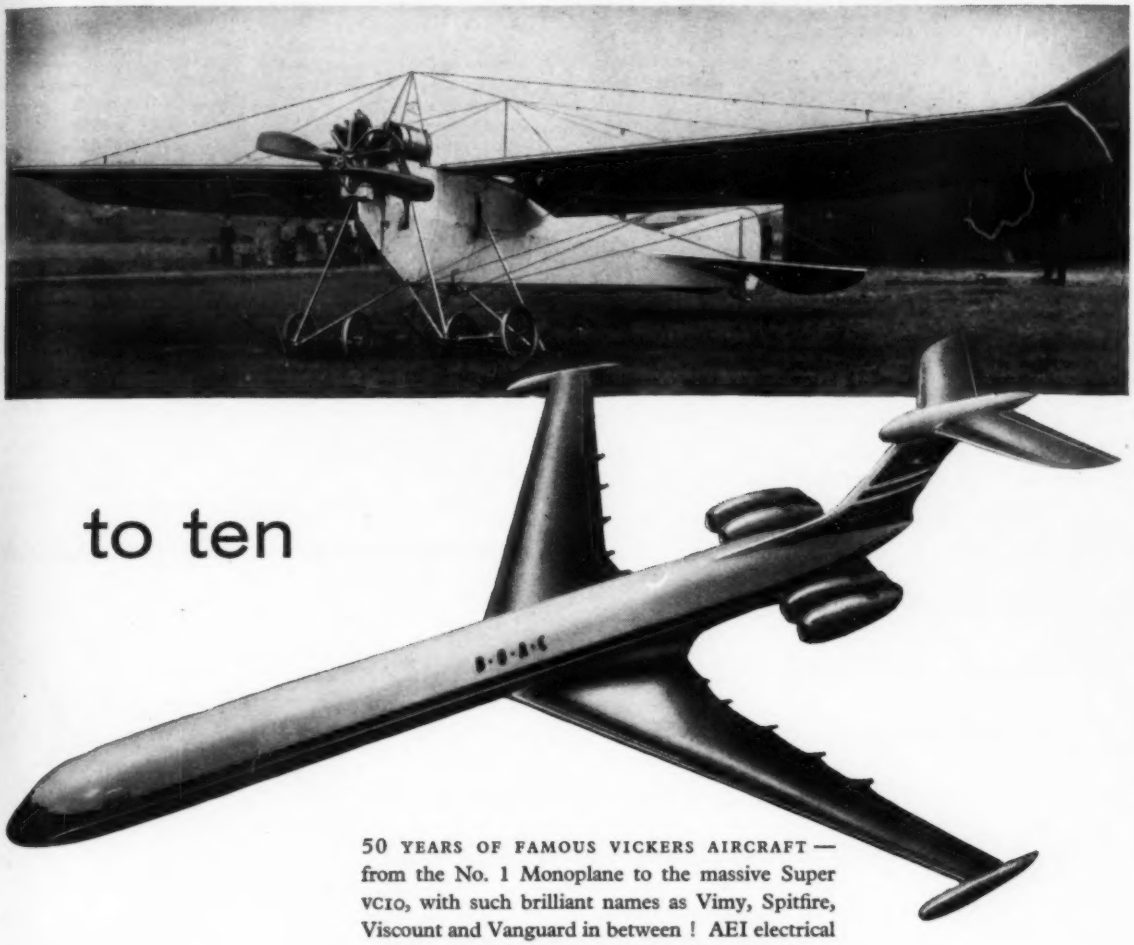

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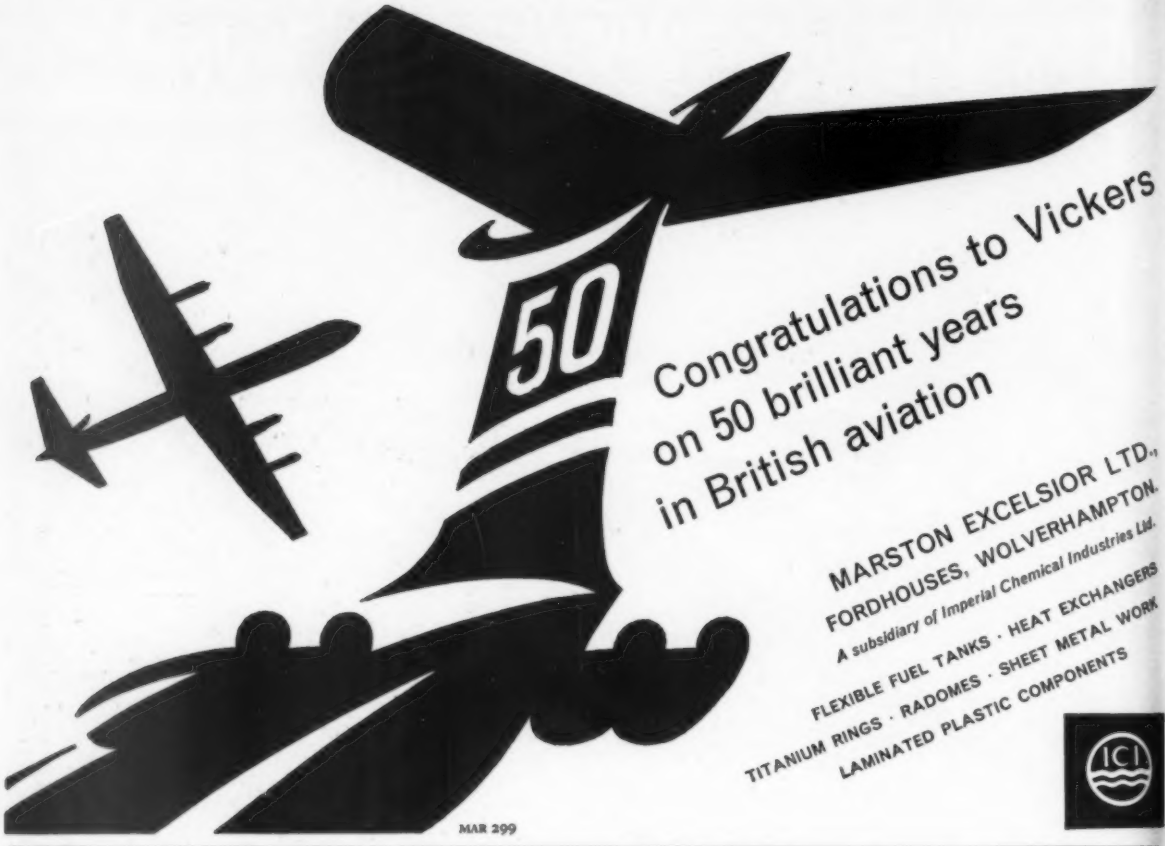

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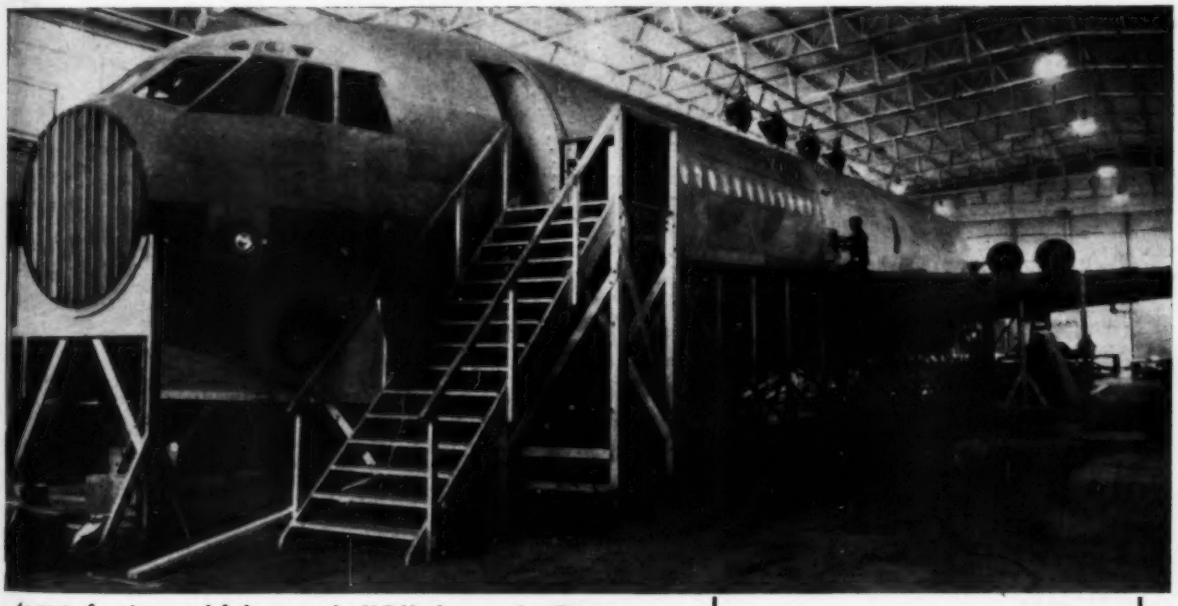

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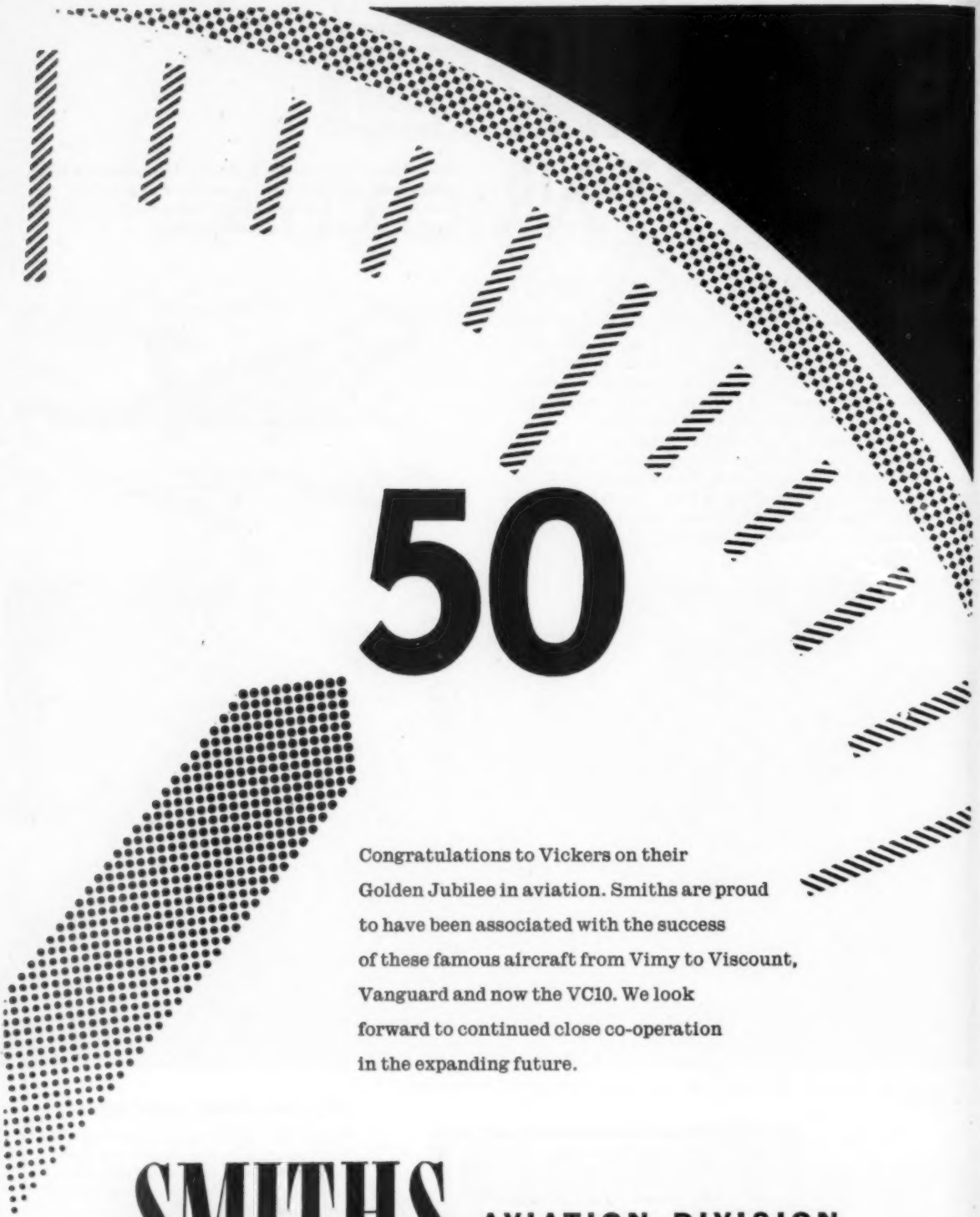

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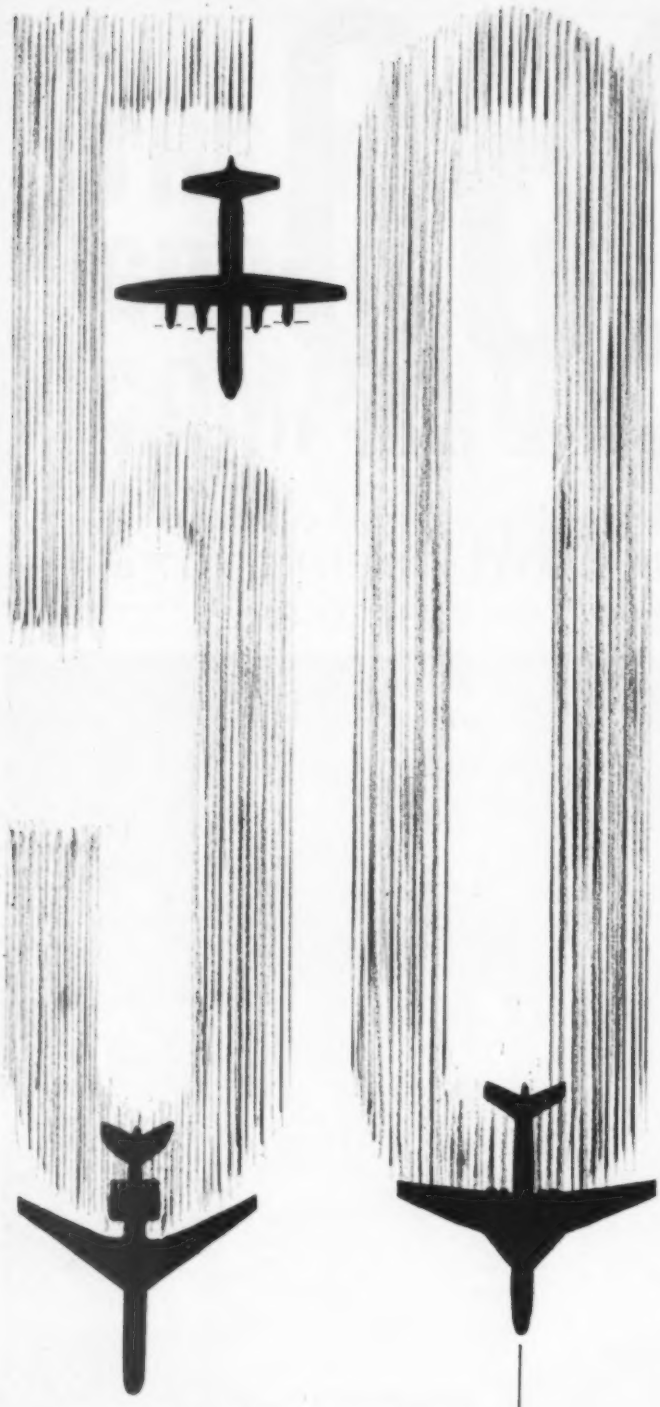

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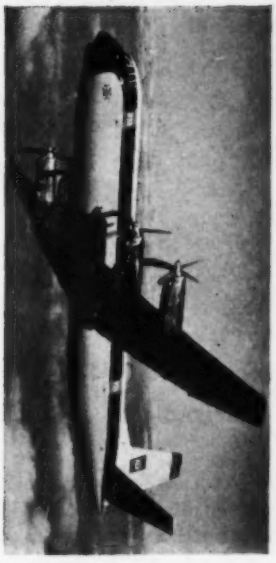
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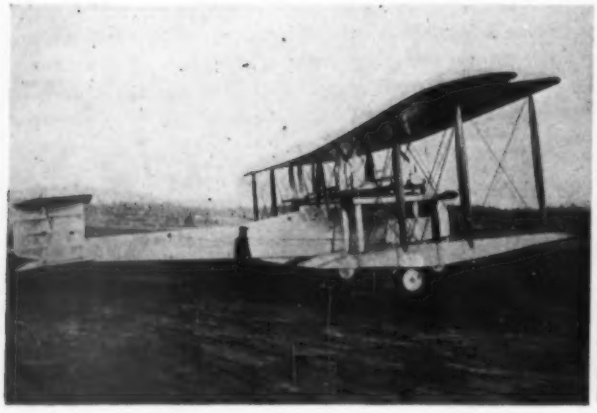

This is the Vickers Vimy in which Alcock and Brown made the first direct transatlantic flight in June, 1919. Their time was 16 hours 12 minutes. The aircraft was powered by two Rolls-Royce Eagle engines.

This is the shape of the future, the Vickers Super VC10. Ordered by B.O.A.C., the Super VC10 will fly at the beginning of 1964 and is intended for special high-density routes. It is powered by four Rolls-Royce Conway by-pass turbo jets.

These two pictures illustrate the years of successful co-operation between Vickers and Rolls-Royce. Both aircraft, one with a distinguished past, the other with an exciting future, are products of this partnership.

Between the Vimy of 1918 and the Super VC10, which will fly in 1964, have come many famous aircraft, designed and built by Vickers and powered by Rolls-Royce. They include the record-breaking Supermarine Schneider Trophy winner and the highly successful Viscount.

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Regulation 10(15)

MORE encouraging than the uninspiring constitution of our new Air Transport Licensing Board is the fact that its hearings, due to begin next month, will be held in public. Like a court of law, the board has properly been given the right to hold hearings in private at its discretion; but it is to be hoped that the exercise of this discretion will be as rare as the occasions on which its predecessor, the Air Transport Advisory Council, decided *not* to hold hearings in private. In all its eleven years the ATAC never once opened its doors in Dean's Yard to the public.

It is to be hoped, too, that one of the regulations concerning the new board's public accountability will be changed. This particular regulation, 10(15), prescribes that all hearings shall be recorded, but that transcripts shall be made available only if "any party to the case before the board shall so require." This means that the only way in which our airline industry and other interested parties can keep in touch with the proceedings is to be present at all hearings. This is quite unreasonable. There will be many occasions when, say, the commercial manager of ABC Airways will want to follow proceedings to which he is not a party; but in order to do so he must find the time to attend in person. Similar inconvenience will be suffered by the Press; and even people who have actually attended a hearing will often, if not invariably, want to refer back to something that was said.

Only if transcripts of all hearings are fully and promptly made available as a matter of course can our air-transport industry derive full benefit from the fact that hearings before the board will be in open court. Regulation 10(15) is public accountability at half-cock, and it ought to be changed before the board's first hearings next month.

Professionals Only

WITH the disbandment of the remaining Fighter Control Units at the end of January, the Royal Auxiliary Air Force will no longer play a part in the defence of the United Kingdom. The "bright sword" to which we referred in an article on the disbandment of the RAuxAF fighter squadrons (*Flight*, March 8, 1957) has been finally sheathed; for the Air Ministry has decided that with a reduction in manpower needs, following reorganization of the control and reporting system and introduction of new air-defence techniques, the employment of auxiliaries is "no longer justified."

This is a hard decision for the hundreds of men and women who have so faithfully and skilfully manned the FCUs, and it loosens still further the links binding the Royal Air Force to local areas, the cities and counties whose names were part of unit insignia. Sad though all this is, however, the fact remains that early-warning techniques are now so complex as to be more and more a matter for professionals; and if the Air Ministry is satisfied that it can manage without part-time manpower, the decision to close down the FCUs seems to be an inescapable one.

It is to be hoped, though, that the volunteer spirit will not be entirely snuffed out. How valuable such a spirit can be in times of emergency has been brilliantly demonstrated in the brief but proud history of the Royal Auxiliary Air Force, particularly during the Second World War.

Franco-German VTOL Agreement

AS briefly recorded last week, during the recent conference of the NATO Council of Ministers in Paris the French and West German Governments reached a preliminary agreement for the joint development of a VTOL supersonic fighter.

In a Bonn announcement on December 30 both countries were described as having prototypes "in fairly advanced development," and a joint commission will compare their progress and select one for production. Flight trials are expected to begin in 1965, and production to start two years later. Other nations will be invited to participate, and Britain is named as a likely supplier of engines. Nearly a year ago the British Minister of Aviation talked with the French and German Governments about such aircraft; a list of projects appeared in our November 11 issue.

Vive le Mirage

IN last week's issue we reported the decision of the Australian Government to adopt the Mirage III as the next combat aircraft of the RAAF. It is now possible to give further details, and to report that the same aircraft has been chosen as the next intercepter of the Swiss Air Force.

Australia. For a full three years the question of what should succeed the Commonwealth CA-27 Avon-Sabre as the standard fighter of the RAAF has caused heated argument among the Australian Ministry of Defence (Minister, Mr Athol Townley), Air Staff, Commonwealth Aircraft, English Electric Aviation, Lockheed Aircraft, Northrop International, Dassault and others. In spite of the 1958 decision of the Australian Cabinet to integrate American equipment throughout the Australian armed forces, it was finally announced on December 15 that Dassault had won the day. An Australian observer reports that some Cabinet Ministers were against the Mirage owing to the fact that it was not American. To cushion the shock of the decision Mr Townley said that "the Government had regard to its policy that Australian equipment should be *compatible* (our italics) as far as possible with that used by US forces."

The immediate decision announced by Mr Townley is that orders will be placed for 30 Mirages, two of which will be imported from France, the remaining 28 being delivered by Commonwealth Aircraft Corp at Fishermen's Bend. This is welcome news to CAC, who have delivered the last of 112 Avon-Sabres and are now existing mainly on contracts for spares. But there are still many decisions to be taken, and it is by no means clear exactly what proportion of the aircraft will be built in Australia. In Mr Townley's words, the local content will be "substantial."

Most important of the decisions to be taken concerns the powerplant. Although the standard Mirage IIIC is powered by a SNECMA Atar 9C (see data below) Dassault are offering the aircraft with the Rolls-Royce RB.146 Avon 300. The improved economy of this engine confers an appreciable increase in range, and its great thrust (13,220lb dry, 17,420lb with reheat) improves the Mirage's already outstanding rate of climb and altitude performance. As illustrated in our April 22, 1960, article on the aircraft, an SEPR rocket pack is an optional extra, and it is one which the RAAF may consider worth having. Whichever engine is chosen, it will be made locally by CAC, who have already manufactured at least 300 first-generation Avons for Canberras and Sabres. Conversion of the Sabre to Avon power resulted in such delay that there is a strong body of opinion in Australia in favour of CAC making an exact copy of the French aircraft; but everybody acknowledges that the RB.146 results in superior performance.

Another major variable is the radar fire-control system. The French Mirage is equipped with the Cyrano, produced by CSF, who on December 20 announced in Paris that the RAAF aircraft "will be equipped with CSF airborne fire-control radar . . . the Australian industry . . . will participate in the project." As we go to press this decision could not be confirmed; the main competitor is the Ferranti Airpass 2. Another major portion of the aircraft which may be imported from France is the Messier landing gear. Martin-Baker at least should be well placed, for their lightweight (Mk AM4) seats are used in all Mirages. The RAAF's standard air-to-air guided weapon is Sidewinder, which has already been fired from the Mirage; if guns are to be fitted they are likely to be Adens, and not the French DEFA.

CAC are due to deliver the first of their initial batch of 28 aircraft late in 1963, and even this limited programme should ensure production until 1965. In all probability the total quantity produced in Australia will be much greater, for 30 aircraft will equip only one squadron and an OTU, and would result in a unit cost—even for an exact copy of the present aircraft—of approximately £1.1m.

Switzerland. Approximately three years ago deliveries of 100 Hawker Hunter F.58s were about to begin, and the Swiss Air Force began a long-term investigation to determine what type of aeroplane should next be bought. The requirements were particularly stringent, demanding exceptional short-field performance and good handling in turbulent air at relatively low speeds, in addition to supersonic speed, a high rate of climb and the ability to operate in both defensive and offensive roles. After rejection of such widely differing aircraft as the English Electric Lightning, Fiat G.91 and Lockheed F-104, the field was narrowed to the Saab-35H Draken (described last week) and Mirage.

Announcement of the choice of the French aircraft was made by the Swiss Federal Council in Berne on December 28. It was stated that the total vote would be 90m Swiss Francs (about £75m). Approximately one-third of this sum is expected to be allocated to the purchase of complete aircraft from Dassault, together with a licence to manufacture the machine in Switzerland. The total number of aircraft being bought is given as 100, suggesting a unit price considerably less than that for the Australian machines. No details are yet available regarding the aircraft themselves, beyond the fact that the airframe will be "strengthened" and will incorporate an arrester hook. Guns are likely to be Oerlikons. Manufacture of these aircraft in Switzerland will entail an appreciable expansion of that country's aircraft industry.

Mirage III leading data: Powerplant, Atar 9C, 14,110lb with reheat, plus 3,300lb rocket; span, 27ft; length, 45ft 5in; gross weight, clean, 17,600lb; maximum weight, 22,860lb; peak Mach number, 2.15; take-off run, clean, 2,300ft; landing run, 1,600-1,900ft; guns, 2 × 30mm (opt); stores: nuclear bomb, or combinations of Sidewinder or AA.20 or AS.25 missiles.

FROM ALL QUARTERS

US Army Order More Caribous

AN order by the United States Army for 24 DHC-4 Caribous was announced by de Havilland Canada Ltd last weekend. Its value is given as $16m (£5,714,000) and it brings to a total of 51 the Caribou aircraft now on order for the US Army. Of these, the first 27 are in production and the new batch of 24 will come off the Toronto line at a rate of four per month during 1962. Including five for the RCAF, the Caribou order-book now stands at 56 aircraft.

Tom Brooke-Smith Honoured

FIRST award of the Air League Founder's Medal—gift of Mr Stephen Marples, who with Col H. S. Massy founded the Air League of the British Empire in 1909—has been made to Mr T. W. Brooke-Smith, until recently chief test pilot of Short Brothers & Harland Ltd. Awarded for "the most meritorious achievement in the whole field of British aviation during 1960," it goes to "Brookie" for his piloting of the Short SC.1, which at Farnborough last September gave the world's first public demonstration of VTOL by lift turbojets, and of transitions from hovering to forward flight. This was the culmination of four years' SC.1 test and development flying by Mr Brooke-Smith.

His name also appears in the New Year Honours List (see page 6) as a recipient of the Queen's Commendation for Valuable Service in the Air.

TO FLY NEXT YEAR: Artist's impression—an exceptionally convincing one—of the Short SC.5/10 Belfast, to be the strategic freighter of the RAF. As reported last week, ten are on order, and advanced military and civil versions are being developed, some with Rolls-Royce Tynes of no less than 9,500 h.p.

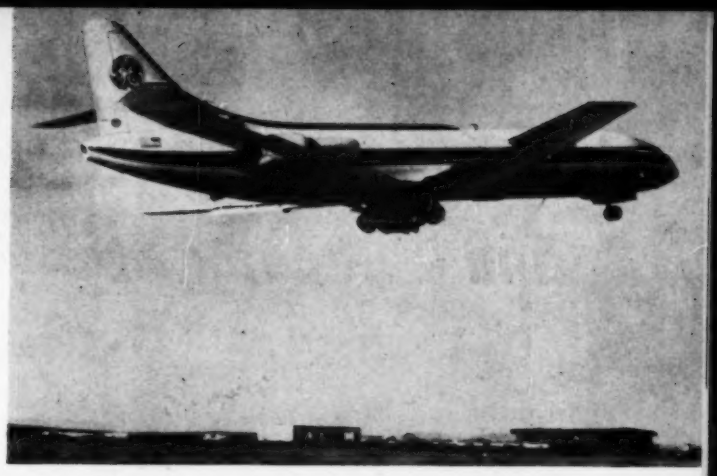
Martin's Last Aircraft

LAST of a long line of Martin aircraft—12,400 in 51 years—a P5M-2 Marlin was handed over recently to the US Navy by the Martin Co, which is now wholly engaged in missile and electronics production. The company's first aircraft, a 12 h.p. biplane, was built in 1909; its present contracts include the Titan ICBM, Mace and Matador tactical missiles for the USAF, Bullpup for the USAF and Navy and Lacrosse and Pershing for the US Army.

P & W Turbofan Data

PRATT & WHITNEY specifications of the JT3D turbofan family include the following figures; those for the -3 and -5A have not previously been published:—

	JT3D-1	JT3D-3	JT3D-5A
Dry weight (lb)	4,065	4,170	4,490
Take-off rating, dry (lb)	17,000	18,000	21,000
Corresponding s.f.c.	0.520	0.535	0.605
Max cruise (s-l, static, lb)	12,500	14,800	16,400
Corresponding s.f.c.	0.500	0.505	0.515
Max cruise at 25,000ft, M0.9	5,300	6,000	6,500
Corresponding s.f.c.	0.829	0.832	0.812



***FRANCO-AMERICAN** co-operation culminated at Edwards Air Force Base on December 30 in the first flight of the Caravelle powered by CJ-805-23 turbofans. The aircraft, purchased from Sud by General Electric, is representative of the Caravelle 7, the model likely to be built in the US by Douglas*

IN BRIEF

Senator H. Wade was sworn in on December 29 as the new Australian Minister for Air.

It is reported from Athens that Greece has sold Yugoslavia some 50 F-84Gs for the "friendly price" of $1m (about £350,000 sterling).

The United States and four NATO powers have signed a £535m agreement for production in Europe of F-104G Starfighters for NATO.

Mr P. Lloyd has been appointed Director-General of Engine Research and Development, MoA. He is a former Deputy Director of Research and Development at NGTE.

A Queen's Colour is being presented to the Far East Air Force next Friday (January 13) by the Earl of Selkirk, UK Commissioner for Singapore and Commissioner-General for South-East Asia, on behalf of the Queen. There is to be a floodlit ceremonial parade at RAF Changi, Singapore.

As noted briefly in our November 25 issue, the US Military Air Transport Service is buying Lockheed C-130E transports as the first step in their interim modernization programme. A contract for 16 was signed last month, and total orders should reach 50 aircraft, costing $170m (£61m). First delivery is scheduled for March 1962.

Mr Eugene Zuckert has been appointed Secretary of the Air Force by US President-elect Mr John Kennedy. Mr Zuckert was Assistant Secretary of the Air Force in the Truman administration and has served as a member of the Atomic Energy Administration. Lt-Col J. B. Swindal has been assigned by the USAF as the president-designate's personal pilot.

In *The U-2 Affair*, a masterly NBC film shown on BBC Television last Monday, part of the *Flight* leading article of June 1, 1956, was displayed with the comment that the U-2 was revealed to the world "First in Britain's *Flight* magazine." (Our references to the trans-Russia flight of May 1, 1960, were published on May 13, May 20, May 27 and July 1.)

Air Cdre F. W. Thompson, CBE, DSO, DFC, AFC, has been appointed Director of Guided Weapons (Trials) at the MoA in succession to Air Cdre W. R. Brotherhood, CBE; and Air Cdre H. M. Russell, OBE, becomes Director of RAF Aircraft Research and Development (B) in succession to Air Cdre W. D. Distrey, CBE, AFC. Air Cdres Thompson and Russell take up their new duties during January.

Mr J. M. Wilson has been appointed a Deputy Secretary in the MoA and Mr R. Burns the Ministry's Principal Establishment Officer.

Sqn Ldr R. A. Streatfeild, a flight commander with No 83 Sqn at RAF Scampton, has been appointed equerry to the Duke of Edinburgh. He succeeds Sqn Ldr John Severne in July.

On December 28 the US Army cancelled its contract for the Republic SD-4 Swallow (*Flight*, December 23, review of Targets and Drones). Total funding had reached $34m; the Army said cancellation resulted from rising costs, and progress with other surveillance programmes.

Cessna Aircraft stated on December 16 that the Peruvian Air Force have selected the T-37 jet trainer; the contract amounts to $3,338,864 including spares, and deliveries will take place from February to December 1961. The Peruvian Air Force operates Sabres, Hunters and Canberras.

Fairey Air Surveys Ltd have been awarded one of the contracts placed by the Government of the Federation of Nigeria during the country's first month of independence. It covers an aerial photographic programme of some 25,000 sq miles in the three regions of the Nigerian Federation, East, West and North.

On December 30 the US Department of Defense formally announced a programme for a large military/civil cargo jet. Bids have been invited by the USAF and Federal Aviation Agency jointly; included in the specification (*Flight*, December 16, page 957) is the ability to fly a payload of 20,000lb across the Pacific and 50,000lb across the Atlantic.

Series production of the first Indian-built jet fighter is to start at Bangalore this month. The aircraft has been designed by the West German aircraft designer Professor Tank and it is expected that the prototype will be displayed on India's National Day, January 26. It is being named "Hindustan Fighter" and 250 to 300 are being built for the Indian Air Force. Orders are expected from other Asian countries.

For the second year in succession a student at the College of Aeronautical and Automobile Engineering, Chelsea, has won the premier award in the City & Guilds of London Institute examinations in Aircraft Servicing and Maintenance (Intermediate). The successful student, Mr N. E. Wright, has also been awarded Aircraft Maintenance Engineer's "A" and "B" licences after examination by the ARB.

The DC-3 drawing by Arthur Bowbeer published in our issue of December 23 has had an appreciative reception from readers, and photoprints—as of most *Flight* cutaway drawings—may be obtained from our photographic department. Prices range from 1s 4d (glossy or semi-matt) or 2s (toned sepia) for a 5¼in × 3¼in size to £6 6s (semi-matt only) or £9 9s (toned sepia) for 40in × 60in size. Photoprints do not include the key.

Winners of the 1960 Sherman Fairchild Air Safety Writing Award for "the most objective and constructive published or broadcast article on air safety" produced during 1959 have been announced. The award and $1,000 were won by Arthur A. Riley, aviation editor of the *Boston Globe*. Edwin G. Pipp, of the *Detroit News*, received an honourable mention and $500. Six certificates of merit (each with $100) were also awarded, one of them to Mark Lambert of *Flight*'s editorial staff. His contribution was the special survey, "Flying Aids," published in *Flight* for February 20, 1959.

***STACKED:** Transporters carrying cars are a familiar sight on the roads, but a transporter loaded with aircraft strikes a new note. This one, owned by Grantchester Garage Ltd, is used by Grantair Ltd, of Grantchester, Cambs, in connection with their new maintenance base at Sywell Aerodrome, Northants. It is carrying a Piper Comanche (top deck) and Tri-Pacer*

Missiles and Spaceflight

The US Air Force is now perfecting the "sea snatch" technique of recovering satellite capsules. The capsule is allowed to fall into the ocean, and is then marked by a smoke bomb dropped by an SC-54 Rescuemaster of the 76th Air Rescue Squadron, from which frogmen then parachute to erect a hooked pole on the capsule which can be "snatched" by the C-119 as illustrated

BRITAIN'S COMMUNICATIONS SATELLITE

On December 21 the House of Commons was able to devote just under an hour to debating the subject of a British communications satellite programme. In the course of the debate the Parliamentary Secretary to the Ministry of Aviation, Mr Geoffrey Rippon, announced that the British and French Governments are [jointly?] inviting "interested countries" to a conference in the near future, and that it had been established as technically feasible that a satellite launcher could be developed using Blue Streak as a first stage and "a second propulsion stage based on French development work." The following are extracts from the debate:

MR AIREY NEAVE "We have studied proposals for using British satellites and British launchers and most of us are convinced that it is an attractive economic proposition for this country. On this basis the cost of the further development of Blue Streak and Black Knight is justified . . .

"At the moment the British Commonwealth handles half the world's international traffic through our successful investment in the past in long-distance submarine cables and radio-telephone systems. I should mention the proposal for a new round-the-world cable, which, I understand, is to cost about £88m . . ."

Mr Neave went on to outline the broad financial details of a 20-year programme involving 70 launchings. Aggregate outlay would be £243m, and cost rate per channel about £1 per min for the first three years and 10s for the next three. A gross profit of £90m should be made in the third year. In the 17th year the charge should be down to 6d per min, with an annual gross profit of £50m to £60m.

MR WOODROW WYATT "In October the American Telephone and Telegraph Co and the Bell Telephone Co officially put forward a comprehensive scheme . . . which initially would cost £60m. but they estimated the revenue from the operations at something like £1,000m a year. As the operating costs are very low, nearly all of this would be profit. This may be exaggerated. On the other hand, I think that the British estimate is very much too low. Anyway, somewhere between the two estimates lies the probable profit to be made out of this, and it may be between £500m and £1,000m a year . . ."

MR DAVID PRICE "The costings show that it would be possible, as my hon. Friend the Member for Abingdon said, to reduce transatlantic telephone calls from the present £1 a minute to 6d a minute in about the fifteenth or sixteenth year. As a result of this study we believe that it is possible, on the basis of market survey so far carried out, to increase the telephone communications round the world by a factor of ten.

"The profit figures . . . show a return of over £450m over 20 years on an outlay of about £300m. That is good profit in any terms, even for a Government . . ."

MR GEOFFREY RIPPON "I am sure it is right, as my hon. Friend the Member for Abingdon has done, to consider, first, the possibilities of a communications satellite. This is no astronomic boondoggle. Both British and American experts are confident that the purely technical problems can be solved within the next few years. To this end Post Office and Ministry of Aviation scientists and engineers are already making a joint study of the design of ground stations and satellites, as well as the important question of overall system design. These studies are concerned both with the technical and with the economic aspects of satellites. Naturally, we shall at the appropriate stage seek the co-operation of private industry. We are well aware of the thought that private industry is devoting to this matter."

Mr Rippon went on to emphasize the "immense importance" of the whole matter; the Cabinet itself was involved, and he did not believe that problems could be solved by having another joint committee. He went on to discuss the basic characteristics of passive and active satellites, together with the number employed and their orbits and then continued:—

"The most promising area for the tests is in the North Atlantic. We have had preliminary talks with our friends in Canada and in the United States, and my right hon. Friend the Postmaster-General hopes to be able to take part in very valuable tests within the next year or so. We envisage putting two or three satellites into polar orbit. We would share the information resulting from the tests, but, of course, that does not necessarily imply a joint communications programme.

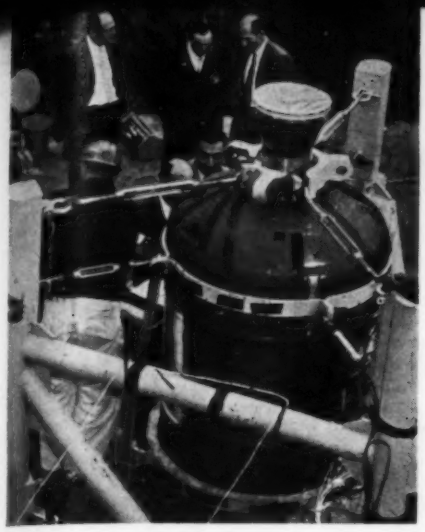
"Much has been said about the potentially large communications capacity of a satellite system, and we may certainly expect a growing demand. Some experts believe that the growing demand for communications will force the world to use satellites within the next decade. Undoubtedly when they are fully developed they can be expected to carry several hundred simultaneous telephone conversations and to act as television relay stations. We are aiming at about 1,000 channels for an active satellite. There is no limit to the number of channels for a passive satellite.

"The extent to which the new system will prove to be an economic proposition must depend, first, on the results of the tests which we hope will commence as soon as the technical developments permit, and, secondly, the availability of a launcher, about which I will say more in a moment. In the meantime, we will continue with the construction of the submarine cables to provide for the communication needs of the Commonwealth. My hon. Friend the Member for Eastleigh referred to a figure of between £80m and £100m. The only part of that programme which is approved would cost between £35m and £40m. The United Kingdom's share would be less. That relates to the cable between Canada and the United States in 1961 and between Canada and Australia in 1964. I cannot accept what my hon. Friend the Member for Eastleigh said about submarine cables necessarily being a waste of money.

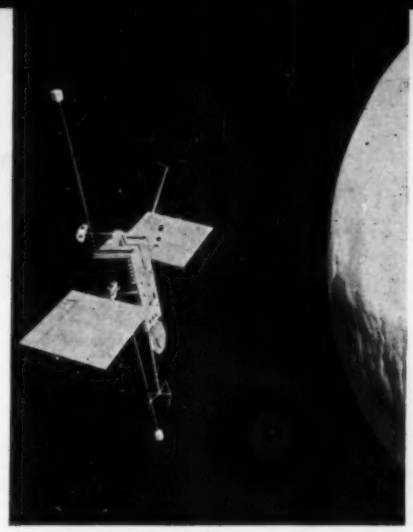
"I now wish to say a word or two about Blue Streak and its potentialities . . . When the Government decided not to proceed with the development of Blue Streak as a military weapon, we also decided to keep in being those aspects of the project which could be of use in developing a satellite launcher, while full consideration was given to the problems involved. This has permitted the preservation of scientific and technological skills and the retention of teams necessary to develop a satellite launcher. We have not run down the work below the level needed to maintain a satellite launcher programme.

"Reference has been made to the delay. Should such a launcher be developed, the work that we have done and are doing will enable us to formulate a programme which will enable us or any other participating country to put satellites into orbit in the course of the next five or six years. There is no fear that the development of a launching vehicle such as we have in mind would be too late to produce valuable results.

"We have kept the work on Blue Streak going and we can develop it if we choose. In the meantime, we have reached the conclusion that if a heavy satellite launcher is to be developed outside the United States or Russia, there are substantial advantages for all concerned in doing it in co-operation with our friends in the Commonwealth and Europe. My right hon. Friend has had talks in Australia and Canada, and we are keeping in close touch with those countries and other members of the Commonwealth . . . Australia, in particular, has been our partner throughout and has a direct interest. If we carry the Blue Streak proposals to completion, the facilities at Woomera would be used . . . We have taken an initiative both with the Commonwealth and with Europe . . . We have also had lengthy discussions with



United Technology Corp have a NASA feasibility contract for conical segmented solid-propellant rockets. The photograph on the left shows last-minute preparations before the successful firing of a 15,000lb-thrust motor, burning for one minute



NASA have chosen Space Technology Laboratories as prime contractor for the orbiting geophysical observatory (right). The OGO will be NASA's first standardized multi-purpose satellite, as described below

representatives of the French Government on the joint development of a satellite launcher based on Blue Streak. These discussions have envisaged collaboration in both finance and technology.

"So far . . . our discussions with our French friends have gone well. We must, however, recognise that just as this is a major decision for us to take, so it is a major decision for any other country. On the technical side, we have established that it is practicable to develop a satellite launcher using a first propulsion stage formed from our own Blue Streak and a second propulsion stage based on French development work. On the policy side, we came to the view that the next step is to ascertain which other countries would wish to join in sponsoring the development of such a launcher and to undertake other parts of the development.

"To that end the House will be interested to know that we and the French Government have it in mind that interested countries should be invited to join in a conference early in the New Year. We hope that from such a conference will emerge a sufficient indication of the degree of interest in this project to enable us to take firm decisions. As a preliminary to this conference, we are inviting individual countries to send their experts here for discussion and to judge for themselves the technical soundness of our proposals and the distance we have already gone in development. I agree with the House that we have gone a considerable distance. I cannot say more at this stage as the matters which I have described were settled in Paris only last week and we are now working out the detailed steps which will lead up to the conference which I have announced.

"Meanwhile, we are keeping the Blue Streak work going at what, we think, is the right level, striking a balance between the need to limit expenditure to the minimum in advance of policy decisions and the need to obtain a viable nucleus of the many skills which must be deployed in strength once the policy decision to go ahead is taken."

SKYBOLT SCARES

Scare-stories of difficulties and delays with GAM-87 Skybolt are becoming commonplace. Our contemporary *Aviation Week* has now stated that the missile is likely to be cancelled owing to the accelerated development of the B-70 and Minuteman, claiming that no further funds will be authorized beyond the end of Fiscal Year 1961 (ending on June 30). The US Air Force replied that about $80m (£28.6m) had been voted early in 1960 and that additional funding of about $70m (£25m) would be required during FY61. The GAM-87 programme was being reviewed, and the $70m appropriation was being curtailed. The effect of this adjustment upon key system dates was not expected to be substantial, and final deliveries should be less than four months late.

Yet another report claimed that the programme would be curtailed, or even cancelled, unless the British Government put more money into it. It has been unofficially reported that the total British vote for adapting Vulcans to carry the missile is £37m—an ample figure for fewer than 200 aircraft. All work involved in matching Skybolt to RAF Bomber Command requirements is being paid for from British funds, and the USAF have denied that Britain's requirement for Skybolt has any bearing on the curtailment of the FY61 supplementary appropriation. A further nigger in the woodpile was provided by the announcement that the personnel strength at Northrop Nortronics Division engaged in the development of the Skybolt guidance system was being cut by about 50 per cent. Nortronics hurriedly emphasized that the reductions arose from the fact that most of the work had been done. Then, on December 30, Douglas said they were reducing the Skybolt work-force by 1,200.

British newspapers continue to refer to a British project known as the Bat, said to be under consideration as a possible insurance against failure of Skybolt to materialize. According to the London *Daily Mail*, the Bat will be "a supersonic, hedge-hopping H-bomb missile," for which a £1m design contract is likely to be placed this month. The London *Times* says that the Minister of Defence, in his avowed search for a diverse range of delivery systems, is promoting "a low-level missile that could fly below an enemy radar screen." It links this missile with TSR.2.

OGO

The right-hand illustration above is the first to show the OGO orbiting geophysical observatory, three of which are to be delivered by STL to NASA within three years at a cost of more than $15m (£5.4m). OGO will be a standardized vehicle with modular compartments capable of carrying 50 different experiments in a given mission. It will be approximately 6ft long by 3ft square, with two 6ft-square solar paddles. Gross weight will be 1,000lb (including 150lb of payload), rising later to 1,500lb. The craft will be stabilized so that the same axis constantly points towards the earth, and it will carry wide-band, narrow-band and special-purpose telemetry systems.

Under the code-name of EGO, the first mission projected for the satellite will be a study of energetic particles, for which purpose an Atlas Agena B will place the OGO in a very eccentric orbit with a perigee of 170 miles and apogee of almost 70,000 miles. Approximately 9 months later a Thor Agena B will launch POGO (polar orbit OGO) with perigee of more than 170 miles and apogee of about 650 miles. Among the scientific missions planned for OGO are measurements of magnetic fields, atmosphere structure, ionosphere, dust, energetic particles, planetary parameters, solar physics, astronomy, meteorology, biology and tests of structures.

The third US Navy Polaris submarine, *Robert E. Lee*, successfully fired a missile while submerged at the head of the Atlantic Missile Range on December 29. It was the 13th Polaris to be fired from a submerged submarine.

NASA announced on December 29 that Explorer 8, launched on November 3, ceased transmissions "several weeks earlier than expected." Battery failure is given as the cause; the last signal was received at Quito, Ecuador, on December 27.

Air Marshal C. R. Slemon, RCAF, who was in the "hot seat" at Norad HQ on October 5, stated last week that there was never any likelihood of nuclear retaliation on that day. Signals detected by the BMEWS at Thule, later identified as reflections from the rising Moon, were not identical to those caused by incoming re-entry vehicles.

On December 23 NASA announced that the severe solar storm on November 12 produced "a substantial change" in the orbit of Echo I. During the storm, the atmospheric drag of the 100ft balloon satellite increased "by a factor of two," increasing the period of orbit by 2sec per day. Current data on the revised orbit are: apogee, 1,334 miles; perigee, 619 miles; period 117.428min.

Discoverer 19 was launched from Vandenberg AFB on December 20 and went into a 93min polar orbit with perigee and apogee of about 500 and 600 miles respectively. Total weight in orbit is 2,100lb, and in place of the usual Discoverer capsule is equipment measuring the wavelength and intensity of infra-red (heat) waves from the Earth beneath. The equipment is similar to that which will be installed in the Midas satellites to detect ICBM launchings. Discoverer 19 ceased transmitting on Christmas Day, unexpectedly early.

Further details are now available of the "Ballute" (drag balloon and parachute) method of recovering vehicles from above the atmosphere. The first Ballute was launched from Santa Rosa Island (on the west coast of Florida) on November 21, when a 500lb capsule was sent to a height of 32 miles. When the capsule had fallen to 75,000ft it streamed a 9ft spherical balloon, which opened within 0.1sec. The balloon was reeled out by cable, reducing the speed to below M1 at about 35,000ft. Finally a parachute lowered the capsule into the Gulf, the capsule being recovered after 45min.

The New Year Honours

CIVIL-LIST AWARDS IN AVIATION

E. R. Lewis (Knighthood)

IN the New Year Honours List, made public last weekend, several prominent figures in the aircraft-equipment field receive knighthoods; and two technical directors, one of an aircraft firm and the other of an engine manufacturer, are appointed CBE. Two well-known test pilots are also named in the list.

The names given on this page are selected from the civil branches of the various Orders; Service honours and awards are given in detail on page 36 of this issue.

G. C. I. Gardiner (CBE)

A. A. Rubbra (CBE)

KNIGHTS BACHELOR

G. E. Beharrell, chairman, Dunlop Rubber Co Ltd; C. Dannatt, vice-chairman, Associated Electrical Industries Ltd; E. R. Lewis, chairman, Decca Navigator Co Ltd and Decca Radar Ltd; Prof A. C. B. Lovell, Professor of Radio Astronomy, University of Manchester, and director of Jodrell Bank Experimental Station.

ORDER OF THE BATH

CB

L. R. Bradley, lately director-general, curator and secretary, Imperial War Museum; W. H. Stephens, Director-General of Ballistic Missiles, MoA.

ORDER OF ST MICHAEL AND ST GEORGE

CMG

F. Cooper, Assistant Secretary, Air Ministry.

ORDER OF THE BRITISH EMPIRE

CBE

G. C. I. Gardiner, technical director, de Havilland Aircraft Co Ltd; C. W. Goodman, chairman and managing director, English Electric Co of Australasia Pty Ltd; F. E. McGinnety, Director-General of Inspection, MoA; J. R. Pheazey, vice-chairman and joint general manager, Standard Telephones and Cables Ltd; A. A. Rubbra, technical director, Rolls-Royce Ltd; A. J. Young, managing director, English Electric Valve Co Ltd.

OBE

A. W. Bedford, chief test pilot, Hawker Aircraft Ltd; J. Black, works manager, Mossend, Imperial Chemical Industries Ltd; D. O. Burt, engineer I, Royal Aircraft Establishment; Miss M. J. Craig, secretary, RAF Escaping Society; C. W. M. S. Finney, Chief Mechanical Transport Officer, MoA; F. W. J. Gale, managing director, S. G. Brown Ltd; D. Grey, commercial international manager, BEA; Obs Capt N. F. Lockyer, commandant, West Area HQ, ROC; H. W. Sanders, superintending civil engineer, Grade I, Air Ministry; W. C. Taylor, vice-chairman, Qantas Empire Airways Ltd; F. A. White, principal, Air Ministry.

MBE

H. O. Adshead, clerical officer, MoA; G. C. Bentley, senior executive officer, Air Ministry; J. M. Black, chairman of committee, No 128 (Barrow) Sqn, ATC; R. S. Carlsson, skipper, Trawler *Northards*, Fleetwood, for service in salvage operations for recovery of aircraft lost at sea; J. Curmi, airport manager, Luqa Airport, Malta; C. H. K. Donnelly, Royal Australian Air Force Finance Adviser, Malaya; Mrs E. A. Drew, supervisor, WVS, RAF Sylt, Germany.

P. B. Elwell, for services to aviation in East Africa; Obs Lt A. J. Gothorp, duty controller, No 15 Gp, ROC; S. N. Green, Acting Chief Superintendent of Aircraft Repair, Royal Naval Aircraft Yard, Belfast; E. W. Hawken, senior executive officer, Air Ministry; J. G. Heaps, chief of test and inspection, Ferranti Ltd; H. F. Hollands, clerical officer, Telecommunications Engineering Establishment, MoA; Sqn Ldr F. B. Holt, chairman of committee, No 1263 (Rochdale) Sqn, ATC; R. N. James, engineer II, MoA; Capt E. N. Jennings, operations manager, British United Airways Ltd.

H. E. Langley, senior executive officer, Air Ministry; K. MacIntyre, experimental officer, War Office (formerly of MoA); V. J. Neyle, engineer II, A & AEE; W. H. Norwood, senior executive officer, No 14 MU, RAF Carlisle; Capt J. R. Orbell, deputy operations manager, Central African Airways; H. L. Pilkington, manager, quality staff, David Brown Industries Ltd, Huddersfield; G. J. Pratt, lately executive officer, Air Ministry; B. Rawlings, technician I, Royal Aircraft Establishment; H. W. Rose, higher executive officer, Air Ministry; Miss O. M. Round, secretary, Oxford University Air Squadron; A. J. Taylor, experimental works manager, Dowty-Rotol Ltd; R. G. Taylor, general manager, C. & N. (Electrical) Ltd; Capt T. Young, lately master, salvage vessel *Twyford*, for services in salvage operations for recovery of aircraft lost at sea.

A. W. Bedford (OBE)

T. W. Brooke-Smith (Queen's Commendation)

ROYAL VICTORIAN ORDER

CVO

Gp Capt A. D. Mitchell, RAF.

MVO (Fourth Class)

Wg Cdr H. G. Currell, RAF; Wg Cdr D. Wood, RAF.

ROYAL VICTORIAN MEDAL (Silver)

Flt Sgt P. DeNaever, RAF; Ch Tech D. K. Hicks, RAF; Cpl D. J. Thomas, RAF.

QUEEN'S COMMENDATION FOR VALUABLE SERVICE IN THE AIR

J. P. Cunningham, senior captain and fleet captain, East African Airways DC-3 Fleet; P. R. Lear, experimental officer, Royal Aircraft Establishment, Farnborough; S. J. Nicolle, senior training captain, Pionair aircraft, BEA; T. W. Brooke-Smith, lately chief test pilot, Short Bros & Harland Ltd; Miss J. M. Wright, commercial pilot, Wilson Air Services Ltd, Nairobi.

BRITISH EMPIRE MEDAL

A. S. Berry, engineering technician, Grade II foreman, MoA Waltham Abbey; B. G. W. Braham, driver (motor transport) BOAC; H. Broughton, superintendent of stores, No 7 MU, RAF Quedgeley; E. S. Chidsey, foreman carpenter, Vickers-Armstrongs (Aircraft) Ltd; B. L. M. Coffin, technician, Class Grade III, RN Aircraft Yard, Gosport; A. W. Colley, foreman painter, Saunders-Roe Ltd; R. W. Crawford, assistant chief inspector, Armaments Division, Sir W. G. Armstrong Whitworth Aircraft Ltd; R. Goodwin, foreman, Newton Bros (Derby) Ltd; L. I. Hall, leading hand, Royal Aircraft Establishment, Farnborough; W. C. Jackson, leading illustrator, Inspectorate of Armaments, MoA, Woolwich; A. Matthews, research and development craftsman special, Royal Aircraft Establishment; A. E. May, development inspector, Bristol Siddeley Engines Ltd; F. G. Mayhew, head servant, RAF College, Cranwell; W. T. E. Middleton, chief office-keeper, Air Ministry; T. C. H. Miles, fitter, Elliott Bros (London) Ltd; E. G. J. Pendergast, MoA, Royal Ordnance Factory, Burghfield; G. Rimmer, Ch Obs, Post 2/R3, No 2 Gp, ROC; Miss Z. M. Snell, Ch Obs, No 9 Gp, ROC; P. H. Spivey, station warden, HQ Coastal Command, Air Ministry; Mrs F. Tarrant, head tracer, Royal Radar Establishment; W. F. Young, radio tech, RAF North Weald.

CRANFIELD CHANGES

THREE departments of the College of Aeronautics, Cranfield, are being re-named. The Department of Aircraft Economics and Production becomes Production and Industrial Administration; Aircraft Electrical Engineering becomes Electrical and Control Engineering; and the Department of Aircraft Materials the Department of Materials. These changes are being introduced progressively during the current academic year, so that they become established by the beginning of next session, in October this year.

As part of its diversification of activities since 1959, the College now offers advanced courses (in addition to the two-year specialist courses for aeronautical engineers) in the re-named departments, as follows: *Production and Industrial Administration:* economics and production, precision engineering, production technology, operational research and ergonomics; *Electrical and Control Engineering:* industrial control engineering and flight control; *Materials:* the physics and mechanics of structural materials, and welding technology. The departments also provide specialist instruction for students doing space technology and guided-missiles courses.

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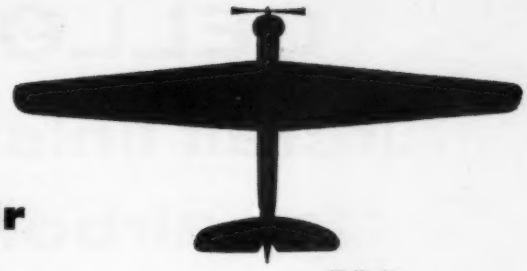
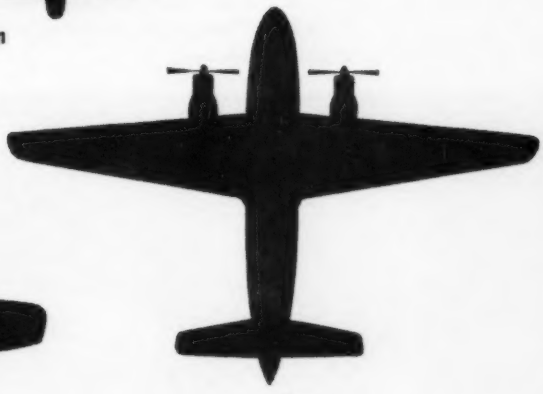


Wellesley

Spitfire

Wellington

Vanguard



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The New Shape of the Industry

as seen by
SIR GEORGE DOWTY
FRAeS, MIMechE, FIAS, Hon FCAI
president of the SBAC

in an interview with
FRANK BESWICK
(second of a new series)

ONE assumes that, in part, the election of Sir George Dowty as president of the Society of British Aircraft Constructors was a recognition of the increased importance of equipment in the make-up of modern aircraft. But it also seemed to me especially appropriate, in this transitional period of the aircraft industry, that the questions I put should be answered by one not directly affected by the changes and able to take a wide view of the industry as a whole. My first question related to the period of reshuffling.

From the outside, the re-shaping of the industry appears to have taken place with extraordinary smoothness; would you say any snags have emerged, or whether there is much tidying-up still to be done?

"We did not expect any particular difficulties in reshaping the industry. It is true that things have gone more smoothly than might have been expected, bearing in mind the complexity of the operation, and this is evidence of the extremely skilful way in which it has been done. You will appreciate that the legal, management and general administrative problems were those that would be met in large amalgamations in any industry; they were not peculiar to the aircraft industry. There is still, of course, a lot to do, and it will be some time before we see the real benefits."

In other words, could I say that if you had been responsible for the problem as chairman of a group covering all the industry, you would be satisfied with the present shape?

"I believe the changes are for the better. Previously there was too much competition and overlapping of effort. Obviously, this was wasteful. In the civil field we can get all the competition we need from abroad. The full advantages of the amalgamations that have taken place will not be manifest for some time, and certainly we cannot get the rationalization that is possible while there is full employment and a shortage of skilled people."

What do you think will be the trend over the next (say) five years, as far as the size of the industry is concerned? Expressed in terms of labour employed, would you expect it to expand, or to contract, or have we about the right size for the next few years?

"Over the past twelve months the labour force has remained the same—around 280,000—within a very few hundreds. We need more skilled men and more technicians. I would not expect any substantial change over, say, the next two years. Now that the industry has reorganized itself we are certainly in a much better state to maintain our position, though as a capital goods industry very largely dependent on exports we are inevitably sensitive to the conditions governing world trade."

After all the talk of redundancy it will be a surprise to many to hear that the industry needs more labour; what has happened to all those men who were marching in the streets not long ago in protest against redundancy?

"The White Paper of three years ago had a depressing effect. Some left the industry because they were fearful about the future. Others marched to protest against *possible* redundancy. They did so because they did not know all the facts and got excited unnecessarily. At no time has the industry been worried about its immediate future and most of us have always been able to look ahead fairly confidently for some two years or so. That position is still true."

Can you now recruit more people from the motor industry?

"This type of labour is not in general the kind that the aircraft industry needs. What we require are specially skilled men and these, of course, include technical staff."

It was generally understood that, when the industry agreed to reorganize in line with official policy, an understanding about future Government support was also reached; would you say that expectations aroused have been fully justified? In particular, do you consider that we are progressing fast enough in the development of supersonic flight and space research?

"There is some evidence that Mr Sandys' promise of Government support is being implemented, even if slowly. In the development of supersonic flight we have, as you know, reached the stage of a contract for a limited design-study. In space research we are still waiting for the Government decision on that part of the programme which most concerns the industry—whether or not we are to have our own vehicles. We are, of course, aware that on the UK scale of expenditure it would be costly, and we would not wish support of space-research to diminish our effort in, say, vertical take-off, where we are doing so well.

"At the moment, however, our attitude to space research seems irresolute and indecisive, which brings me to the point that we shall lose-out on supersonic flight, space research, VTOL and other vital technical and manufacturing developments if Government policy is not a stable and a consistent one."

Although the industry has a magnificent export record up to the present date, do you feel that future prospects are bright enough? To what extent are civil orders going to offset military orders in the export field?

"Our 1960 exports seem likely to dip from the record £156m of 1959. Some time ago the SBAC forecast this decline: it was clear that our military exports were falling seriously and that, for reasons lying beyond the control of the industry, the large military business in NATO and elsewhere for the next few years will not in the main concern British aircraft and equipment.

"It must take some time for civil orders to offset losses of export trade on the military side. Competition will be extremely fierce. Nevertheless, I regard our export prospects as good; but we shall certainly need very considerable help on credit terms for overseas buyers; this must continue to receive urgent attention, and I am glad to note that it is."

There is some criticism about after-sales service in the export field; do you think there is any justification for this criticism, and if so, what is being done about it?

"The industry is very conscious of the importance of after-sales service. This is a field where every manufacturer—whether aircraft or otherwise, British or foreign—comes in for criticism at some time or other. Aircraft, engine and equipment manufacturers are doing a good job in after-sales service. Indeed, we have evidence and many authoritative comments to show that British after-sales service is frequently better than that provided by others, and in this I include the Americans."

Earlier you mentioned a period of two years; do you think there is a danger of employment dropping off when the present orders have passed through the pipeline?

"No, I do not. For one thing I anticipate a substantial growth in cargo transport; but I believe that, apart from new cargo aircraft, if the obsolescent aircraft lying around can be profitably employed on air freighting it will help the airlines to buy new passenger equipment."

What about co-operation with European manufacturers? Has the SBAC a policy there, or is it left entirely to individual concerns?

"This is primarily a matter for individual members of the Society. You will be aware of recent associations between British and European companies with the object of co-operation, not only in the form of licensing agreements (of which there are very many)

The New Shape of the Industry . . .

between British and foreign manufacturers, but in co-operation in design and eventual manufacture. At this moment a number of important discussions between our members and European manufacturers are going on, and some of these talks, too, will probably result in further valuable co-operation. This being in the interests of the members, the policy of the SBAC is to encourage co-operation and to do what is possible and advisable to facilitate it."

Is this development of international co-operation going to change the shape of the industry again? With the even bigger projects—supersonics and space—are we going to need even bigger units?

"Personally, I have doubts about international co-operation. While I hope something will come of it there is no doubt that there cannot be two queen bees in any hive. Is one country going to knuckle down to another? This is the root difficulty of an international effort, for one company must always be the leader."

You don't feel that supersonic transport and space research are going to be so important in the total effort?

"Of course they are important; but I feel in my bones that the *most* important projects for this country are those that will provide a large volume of sales throughout the world. The manufacturing business is one of extremes. I liken it at the one end to the building of a *Queen Mary* and at the other to the preparation of fish and chips. Between these extremes lie all the other types of manufacturing. In the case of the *Queen Mary* a large capital investment is required, and it also necessitates carrying a large inventory for many years. At the other extreme little capital investment is needed and there is no work in progress to finance. In other words, I feel there is greater joy commercially in producing a Viscount replacement than in making a supersonic transport. Of course, advance in research is essential, but we have got to get our priorities right. One of the things on which I hope we shall keep our lead is that of vertical take-off."

Do you think components and engines have a special function in the export drive? Should Britain specialize more in this field when we are thinking of the possibility of a joint international effort in the development of very large and fast aircraft?

"I am not clear what you mean by a 'special' function. Engine and component manufacturers have a normal role to play in export business—that is, their job is to provide the British aircraft industry with the best engines and equipment and, over and above that, to develop and sell the world's best available engines and equipment to other manufacturers and aircraft users. We should certainly not specialize in the field of engines and components to the exclusion of development of large and fast aircraft."

On the point of the special position of components, I had in mind the division of labour on any international effort; is this going to open up new markets for us?

"There is a good deal of interchange already. For instance, Vickers are using some American equipment and my company is providing a major part of the landing gear for the F-104 fighter. Our export of aircraft equipment to America is considerable. There is another related factor. Our American friends are spending so much money and technical effort on space just now that I foresee some curtailment of their efforts on airframe equipment. As a result, it is possible that we shall be able to increase still further our aviation exports to America."

Is there any change in the role of the SBAC in the new set-up? Now that so much inter-company competition has been eliminated, could more be entrusted to a central organization for market and statistical research, for example?

"No change in the role of the SBAC has arisen as the result of the new shape of the industry. Its purpose remains as stated in its Memorandum of Association—'to encourage, promote and protect the British Aircraft Industry,' and that is what it will continue to do. The Society has always engaged in a great deal of statistical and economic research. We have a central organization which could be expanded to cover any other form of research and investigation that might be required."

* * *

The interview made me realize that speaking for the aircraft industry as a whole must be a difficult and somewhat delicate operation. Not all sections can possibly think alike on any given problem. To express an opinion which faithfully reflects all interests must, on some topics, mean that no view of any consequence can be formulated at all. But most will agree, I think, that Sir George Dowty has collated current problems and prospects of the industry very effectively indeed.

He is an essentially individualistic character with strong, sound, down-to-earth ideas, and I found it impossible not to gather something of his own personal thinking. In particular, one notes his cautionary words about the prospects of international co-operation in aircraft construction. And, too, while we are all interested and excited about the possibility of supersonic travel and space research, it is just as well to be reminded that an industry which has to earn its living will have to devote much of its resources to less exotic projects.

UNIVERSITY AERONAUTICAL ENGINEERING

INCLUDED in the Lanchester Memorial Lecture delivered by Prof A. D. Young before the Royal Aeronautical Society on December 22, reported briefly in last week's issue, was the following description of the facilities, scope of work and budget of a typical university department of aeronautical engineering. Prof Young occupies the Chair of Aeronautical Engineering at Queen Mary College, University of London.

The student intake is about 30-40 per year [Prof Young stated] and at any one time there may be between five and ten research students. The aerodynamic equipment includes at least two low-speed wind tunnels of good modern design and about 10-15 sq ft in working-section area, together with a number of smaller tunnels of simpler construction. There are one or two supersonic tunnels with working sections about 20-40 sq in in area and sundry small high-speed jets, and for hypersonic work there are one or two small shock-tubes or a gun-tunnel.

Where the teaching of aircraft structures is the responsibility of the department, as in the case of my department, a laboratory of standard structural test equipment is provided and such laboratories will probably include equipment for vibration investigations and investigations of kinetic heating effects. The teaching staff comprises a professor, a reader and from three to five lecturers, and the department will probably have its own small workshop employing up to half-a-dozen people.

In general the equipment is as small, simple and cheap as modern research and demonstration needs will permit, but ancillary electronic equipment that is increasingly essential for such needs makes very heavy demands on the annual budget. I suppose that the current allowance to my department is not untypical; it is £4,500 per annum to cover all the equipment needs. Of that sum the research students inevitably take the lion's share. Three or four years ago my allowance was less than a third of this figure, and before the war the allowance was about £20! When it is remembered that one good oscilloscope might cost £800 the limitations that economy must impose on university activities will be very apparent.

Here I must pay tribute to the Ministry of Aviation in all its various metamorphoses for the generous way in which it has supported specific items of university research by means of research contracts. Such contracts were rare before the Second World War, but since the war they have become much more common. Most university departments of aeronautical engineering have one or two research contracts whereby they are able to pay some of the junior research personnel concerned and to buy special ancillary equipment.

I believe that at present the Ministry research contracts with universities on broadly aeronautical topics total about £160,000 per annum. This may seem small relative to American practice, but in the special circumstances that hold in this country, namely the relatively large amount of aeronautical research done in Government research establishments and the intense concern of the universities for their independence, this sum is by no means insignificant except in relation to the return that is made for it.

As for the research students, they are generally graduates with first-class or upper second-class honours degrees, and they are usually in receipt of a grant from the DSIR of value £340 to £420 per annum. I need hardly say that good research students are becoming increasingly difficult to recruit because of the far superior pay that graduates can obtain in industry and Government service, and because the status that is conferred on holders of higher degrees in industrial circles in this country is slight by comparison with that conferred in other countries.

Finally, any assessment of the part played by the universities in aeronautical research must be made bearing in mind not only their limited financial resources but also the considerable demands made on the time and energy of the staff by their rapidly increasing undergraduate teaching commitments, and college and university administration needs.

Arresting RN Aircraft

DEVELOPMENT WORK AT RAE BEDFORD

By R. H. TOWNSEND, RCNC

Arrest of a Vickers-Supermarine Scimitar during RAE trials

THIS article, from the "Journal of the Royal Naval Scientific Service," is reproduced by permission of the Director-General Ships, Admiralty. Responsibility for expression of facts and opinions is that of the author, who was until recently with the Naval Air Department, RAE Bedford.

NAVAL arrester gears are designed and built exclusively by McTaggart Scott & Co Ltd, Loanhead, near Edinburgh, to requirements specified by the Director-General Ships. A prototype gear or gears is supplied to the Naval Air Department, RAE Bedford, for proving and developing. This work is the main concern of the Arresting Section of the Ships Installations Division of Naval Air Department, which is staffed by scientific and experimental officers drawn from the MoA and the Royal Naval Scientific Service.

There are two facilities which exist at RAE Bedford for the proving of arrester gears, and the first of these is the safety barrier and arrester gear proving base. This site is powered by a cordite catapult which can propel a deadload of up to 40,000lb at speeds up to 150kt. The advantage of the base is that a representative impact can be engendered without the use of piloted aircraft and hence more economically and with greater control and reliability.

The second site is the arrested-landing deck, which is a 6,000ft long runway with a pit one-third of the way along its length. In this vault, arrester gears are installed and coupled to centre spans which are stretched across the runway, the whole installation being representative of a ship unit. Aircraft are taxied into these wires; they cannot be flown in, as in the ship case, because of the difficulty of driving a 6,000ft concrete runway along at 28kt. The two main functions of this installation are the confirmation with live aircraft of the gear performance figures established by trials at the proving base, and strength proofing of aircraft, i.e., loading the arrester hook with a force greater than the working load it will receive in service. Aircraft proofing is also necessary for stores and modifications which are added to the aircraft throughout its life.

These, then, are the main tools at the disposal of the Naval Air Department and this article will indicate their use in the evaluation of an arrester gear currently being fitted to HM ships to enable them to operate the new generation of Naval aircraft.

The gear comprises fundamentally an energy absorber and an aircraft/energy absorber link.

Fig 1 shows the primary hydraulic system for an arrester gear. The main ram and cylinder both carry at their extremities a bank of pulleys assembled on a shaft. The main cylinder is anchored and hence the set of pulleys attached to it is referred to as the fixed crosshead. The ram is free to move by compressing the fluid and the set of pulleys at the free end of the ram is known as the moving crosshead. Initially, when the main ram is fully extended the whole system is full of fluid at a pressure of approximately 650lb per sq in. When the aircraft engages, load is transferred to the moving and fixed crossheads via the linking system and the moving crosshead begins to move. This motion forces the fluid in the main cylinder through a control valve which is located close to the fixed crosshead. The control valve is known as a spline valve and is a variable orifice with a wide gap at the beginning of the motion reducing to almost nil at the end of the arrest. In this way energy is converted into pressure and dissipated in heat. The fluid, after being forced through the spline valve, passes to the liquid side of the piston accumulator through a non-return valve. When the aircraft has come to rest the non-return valve is closed by the pressure on the air side of the piston accumulator, which is maintained by air bottles at approximately 650lb/sq in. The aircraft is disengaged; then, to restore the unit to the initial conditions, the resetting valve is opened and the 650lb/sq in from the air bottles acts on the main ram through a line by-passing the non-return valve. The moving crosshead moves back to the reset position, the resetting valve is closed and the unit is ready for another engagement. The piston accumulator is fitted to ensure separation of the air and liquid surfaces so that aeration troubles may be reduced to a minimum.

The spline valve is the decisive factor in the behaviour of the ram and hence the characteristics of the arrest. The spline barrel, that part of the valve which dictates the variation of the discharge orifice, consists of a series of grooves of varying depth cut on the outer surface of a cylinder. Three grooves at either end of a diameter correspond and these serve for one particular range of aircraft weights. By rotating the barrel another pair of three grooves is brought opposite the ports which are connected to the main cylinder. During the arrest the barrel moves axially and the variation of discharge orifice is thus decided by the varying depth of the splines in the spline barrel. This barrel motion is controlled by the telemotor ram which is fixed to the main ram and forces fluid through the transmitter cylinder to the minimum orifice end of the spline barrel. A sectional view of the principal parts of the spline valve is shown in Fig 2.

The spline profiles are so cut that for a given aircraft weight the energy involved in an engagement at the maximum speed anticipated is absorbed in the full stroke of the main ram and spline barrel. At the higher energies the spline barrel movement is asymptotic to the working stroke and to all intents and purposes is fixed over the speed range in which a ship normally operates. If the wrong weight setting is used or the aircraft's relative speed into the gear is greater than gear performance allows there is a

Fig 1. Schematic diagram of typical arrester gear

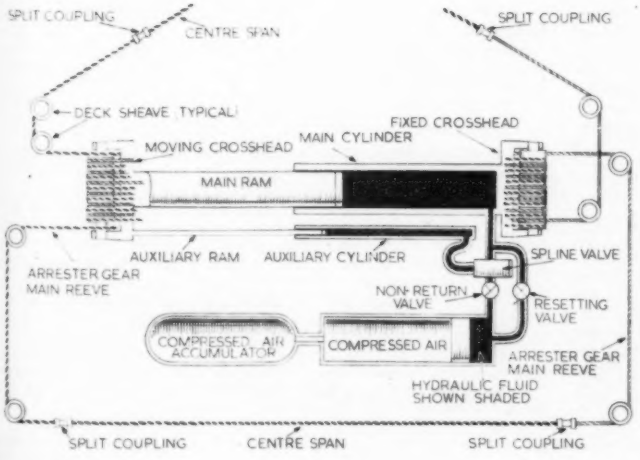
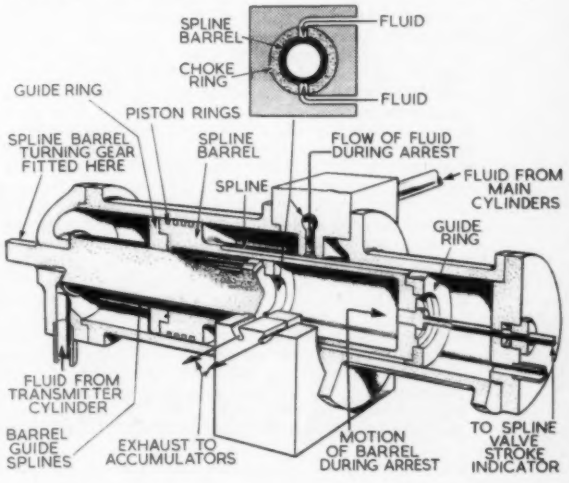
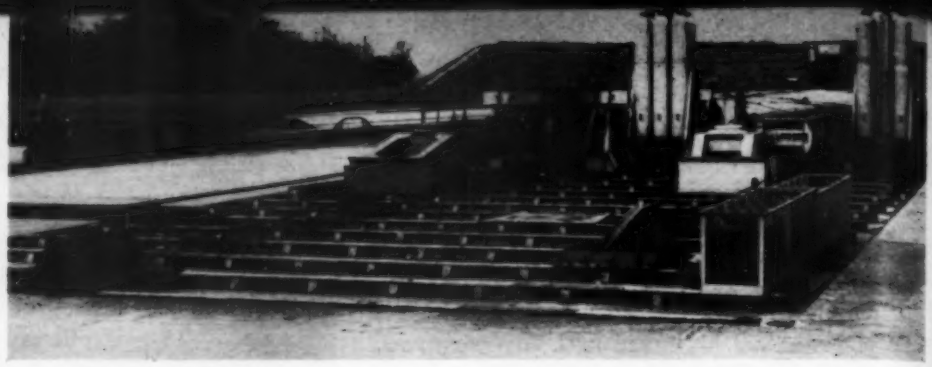


Fig 2. Sectional view of spline valve





Part of the test equipment at the safety barrier and arrester gear proving base at Bedford

Arresting RN Aircraft . . .

danger of the main ram bottoming in the main cylinder, as even at the end of the spline barrel stroke some clearance orifice remains. If this happens and the aircraft still has way on, the aircraft/energy absorber link may part with disastrous consequences.

The Link

For all hydraulic gears the link between the aircraft and the gear is a steel wire rope stretched across the deck with an initial tension and raised above the deck by steel springs in the shape of a bow. In the ship case the bowsprings are retracted by power. The wire rope from the deck is led via a system of guide pulleys to one of the pulley blocks at either end of the main ram; it is then wrapped around the two crossheads missing every alternate pulley. A second wire rope from the deck is led to the other pulley block and wrapped around the two crossheads on the remaining pulleys in the opposite sense from the first rope. The reeving system is indicated in Fig 1. One unit therefore serves two centre-spans on the deck and each wire when rigged is a continuous length of 150 fathoms which serves opposite ends of two centre-spans. As the length across the deck is subject to heavy wear, means are provided for removal so that the centre span may be changed. The wire used in the system is of high quality and special construction determined by tests at NAD and at the manufacturers, British Ropes Ltd, Doncaster.

Basic Problems

The design requirement is the dissipation of a given amount of energy in a certain distance and within the strength of the aircraft and the limits of the human frame. The energy absorbed in a distance of just over 200ft is in excess of 15×10^6ft-lb and this gives rise to a retardation approaching 3g. The limits for the man are uncertain but they are probably of the order of 6g for a sustained load and appreciably higher for peak loads. The distance in which the aircraft has to be stopped is determined by the ship layout and is unlikely to alter appreciably. If uniform retardation were achieved throughout the stroke then higher entry speeds than those currently obtaining could be accepted. In practice the first part of the stroke is used in accelerating the moving parts of the system, of which the rope is a big proportion, up to the speed of the aircraft. These impact loads occasioned by inertia put high forces on the aircraft. Uniform deceleration is therefore not achieved, the ratio of maximum to mean retardation being about 1.5 for modern gears.

The main problems are therefore to use as little of the stroke as possible in accelerating and to secure as closely uniform an acceleration as possible. As far as the hydraulic system is concerned these two points are dependent upon the profile of the grooves in the spline barrel, i.e. at the beginning of the stroke the discharge orifice must be wide to enable speed to be built up rapidly and must then gradually reduce in an attempt to achieve uniform retardation. The hydraulic efficiency is high, for if the mean pressure for the stroke is calculated from the amount of energy absorbed by the unit and related to the maximum pressure produced the ratio is approximately 1.25. The difference between this figure and the overall maximum to mean retardations of 1.5 previously quoted is occasioned by tensions built up in the wire rope system by wave phenomena. This is at present the principal problem and the main obstacle to increased entry speed.

The major parameters which bear upon the problem of attempting to achieve uniform retardation within the strength limits of the aircraft, the wire rope, the main cylinder and the pulley bearings are listed in the next section. The variation of these parameters throughout the arrest is not amenable to calculation and they are therefore recorded from the unit under test conditions at Bedford. From these results, performance is established and improvements recommended. In the course of establishing the performance, mechanical faults occur and remedies are proposed. These improvements in performance and operation result from close co-operation between McTaggart Scott, DGS and NAD.

Main Parameters

The variables measured are rope tensions, main cylinder pressure, ram stroke and aircraft or deadload retardation.

Rope Tension. This is measured using a five sheave rope rider. The rope is deflected around a sheave mounted on a spindle which is supported through strain-gauged links. Under tension the rope attempts to straighten and the pulley support is loaded, thus causing an alteration in the gauges which is recorded and related to rope tension. This rope rider was developed in NAD and has proved extremely successful. Rope tensions are measured at the deck edge sheaves and just before and just after the gear. The difference in tension recorded at these positions is of the order of 10 tons for high energy shots and is caused by reflections and pulley and rope friction as the tension wave passes through the gear. A strain-gauged coupling can also be used to measure rope tension by recording the change caused by the elongation of a connection in the rope. This method suffers from the disadvantage that the connecting lead to the strain gauge is subjected to the same motion as the rope with an increased danger of failure. The measurement of the tensions in the centre span has not so far proved feasible. Attempts are now being made to determine the loads induced in the supporting structure, either of the hook in the aircraft case, or of the bollard in the deadload case, by strain-gauging the supporting members. Indications are that successful records will be achieved but the estimation of rope tensions at the engaging point from the loads in the supports involves a knowledge of the wire geometry at the hook throughout the arrest which is a fundamental property very difficult to assess, as the following brief explanation will indicate.

The behaviour of tension waves in a complicated wire system is imperfectly understood. The only detailed UK study of the problem* applies accepted theory to the arrester gear case over a limited range during the early stages just after impact. This application has not been systematically proved by controlled experiment although a test vehicle to do this has been part of NAD's programme for some time. It is the old story of day-to-day problems taking priority over the furtherance of fundamental knowledge. However, measured tensions accord reasonably well with theory for high entry speeds.

The facts fundamental to the study of tension wave phenomena are that the speed of propagation of a longitudinal stress wave is given by

$$K = \sqrt{\frac{Eg}{\rho}}$$

i.e., the speed of sound in the rope. The speed of propagation of a transverse disturbance is given by

$$c = \sqrt{\frac{Tg}{m}}$$

where E=elastic modulus, ρ=density, g=acceleration of gravity, T=tension, m=line density.

From these two fundamental formulae the following relationship can be deduced for transverse impact of the kind experienced in the arrester gear application

$$T = v^{\frac{4}{3}} \left(\frac{K}{2}\right)^{\frac{2}{3}} \frac{m}{g}$$

This expression is a first approximation and assumes no initial tension in the wire. It can be expanded to give a more rigorous treatment.

When the rope is struck a longitudinal tension wave is engendered which stretches the rope between the point of impact and the front of the stress wave and this stretch gives the slack for the formation of the transverse wave.. The transverse wave is partially reflected and partly transmitted by impact with the centre span couplings and the deck-edge sheaves, and subsidiary longitudinal and transverse waves are set up, some of which return to the impact point until the whole system vibrates violently.

It can be shown that for the case of impact with the deck edge

* *Behaviour of Ropes under Longitudinal and Transverse Impact*, by J. Thomlinson. RAE Report No NA227.

The crew of a Sea Vixen prepare for take-off as a Buccaneer passes overhead.

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Arresting RN Aircraft . . .

sheave the tension in the rope at the first impact will rise to $2.62 \times v^{\frac{1}{3}} \left(\frac{K}{2}\right)^{\frac{2}{3}} \frac{m}{g}$ and this will be increased to $3.75 \times v^{\frac{1}{3}} \left(\frac{K}{2}\right)^{\frac{2}{3}} \frac{m}{g}$ when the transverse wave returns to the impact point and is reflected there. Experimental results show close agreement with the former figure. The latter tension is not achieved in practice because the rope begins to move other than by rope stretch when the moving crosshead of the gear yields.

The longitudinal tension wave travels on from the deck edge sheave, around various leading sheaves, and arrives at the first pulley of the moving crosshead. It will be recalled that the discharge orifice is large at the beginning of the arrest in order that the ram may be accelerated rapidly and therefore the moving crosshead begins to move and this movement takes place before the tension wave has arrived at the second sheave, i.e. while the wire is still slack for a certain distance ahead of the stress front. This slack wire is therefore brought home on to the second sheave with a jerk and another impact is engendered. This process continues until on the last pulley the maximum slack is encountered and the maximum impact from this cause is impressed on the system. The longitudinal stress wave travels at approximately 9,000ft/sec and the transverse wave at speeds up to 600ft/sec for modern gears depending upon the rope tension. These tensions occur during the first $\frac{1}{10}$ sec after impact and are normally the maximum tensions experienced. In the later stages of the arrest the energy-absorbing quality of the fluid is brought into play and is the main factor in determining rope tensions, and the geometry of the wire on the deck becomes more favourable as the pull-out increases and the angle of pull to the middle line decreases.

Main Cylinder Pressure. The pressure is normally measured at one point on top of the spline valve. At high energies this is of the order of 10,000lb/sq in and a Langham-Thompson barrel type pressure transducer is used. For a given weight the pressure record is an indication of the spline valve performance. If the pressure diagram shows a reasonably flat top throughout approximately two-thirds of its length then energy is being absorbed efficiently; but if the spline profile is faulty this can be revealed by, for example, a hump at the end of the diagram.

Ram Stroke. This is recorded by a rotating segmental commutator actuated by a wire passing over a grooved drum with its free end attached to the moving crosshead. Together with pressure it is a measure of the energy absorbed by the unit, and integration of the pressure diagram on a stroke base will give the energy at the unit.

Retardation. The accelerometers used have been developed in the department and are of the direct reading, moving weight spring type. Frequent calibration is necessary to ensure consistency and the mounting must be firm and as close to the c.g. as possible.

This is the critical record as far as aircraft and pilot are concerned. The impact g in the early part of the arrest is the maximum. A high g at the end of the arrest usually means that the full stroke of the gear is not being used, assuming that the energy limit is not being exceeded.

From these recorded measurements the first task of the arrester gear section is to ensure that maximum value is being obtained for money, i.e. that the retardation imposed by the gear throughout the weight and speed range is as nearly uniform as possible. Having established this the next, and principal, function is to recommend performance curves to DGS for issue to the Fleet. These performance curves take the form of a family of iso-g curves drawn against axes of entry speed and weight. For an aircraft at a given weight, maximum approach air speed and permissible retardation are known. Using the landing weight and retardation, the entry speed which the gear can accept is determined from the curves. The difference between aircraft approach speed and entry speed into the gear establishes the wind over the deck which must be contributed by ship and/or natural wind.

It is of interest to note that ideally the iso-g curves should be horizontal straight lines if the same max/mean ratio can be achieved throughout the range covered by the gear.

During the period when this performance is being established, the reliability of the gear is proven and mechanical improvements to make the unit acceptable operationally are suggested and tested. This is the third major contribution of this department to the finished article as used in the Service.

Modifications after Trial

Trials of a recent gear have produced modifications to most of the spline barrel groove profiles. Generally these have consisted of axial movement of the groove down the spline so that cut-off, or minimum orifice, occurs earlier in the arrest and the working ram stroke is not exceeded.

Mechanical troubles which have arisen have mainly concerned the sheaves, both those on the unit and the deck edge sheaves which lead the wire from the deck to the unit below deck.

The crosshead pulley bearing is subjected to a high wire load which is slightly offset because of the lead of the wire to the pulley on the other crosshead. The side load caused heavy bearing pressures of the outer race against the thrust washer and the ensuing high temperatures caused cracks in the outer races. It is hoped that a spheroidal cast-iron thrust washer will reduce the heating caused by side load.

The bursting load of the wire in the pulley groove opened out the rims of the unit sheaves until a foul occurred which led to seizure. The sheaves are now manufactured in a high tensile material.

At high speeds modern aircraft lift the wire to an appreciable height at the instant of pick-up and these up loads were taken on the rim of the deck edge sheave which sighed and dished like a saucer. The deck edge sheave pulleys are now made in a high tensile material.

Two mechanical problems are still with us. As designed, the gear pays out equal lengths of wire rope from each deck edge sheave. If an aircraft hook strikes the wire some distance off centre the aircraft path stays sensibly straight and hence the wire must move through the hook. This movement under load together with the bending round the small radius of the hook imposes high temperatures and stresses on the wire, which result in the rate of wear of centre spans under off-centre conditions being logistically unacceptable. A programme of tests is being pursued which it is hoped will determine the effect of various wire and hook materials and constructions and wire/hook interface materials on centre-span life.

The other problem is the picking up of the wire by the hook. The design of a hook to scrape a wire from the deck at high entry speeds presents a major problem. For example the hook must collect a wire striking high on the sting and yet it must at no time be able to hold two wires, which would put an excessive load on the installation. If the aircraft taxies into the wires the wire is laid flat to the deck and a step wave is put into the rope. This wave moves outboard until it strikes an obstruction, normally the bowspring, when it is reflected and returns inboard. The wire remains grounded until the reflection returns and if the time taken for this to happen is greater than the time taken for the aircraft hook to arrive at the wire after the nose-wheel has passed, the hook will attack a grounded wire and may miss. Efforts are being made to induce a false reflection by obstructions on the deck which will reflect the tension wave and not interfere with aircraft landing or with the various trollies used for storing and arming aircraft.

Sea Trials

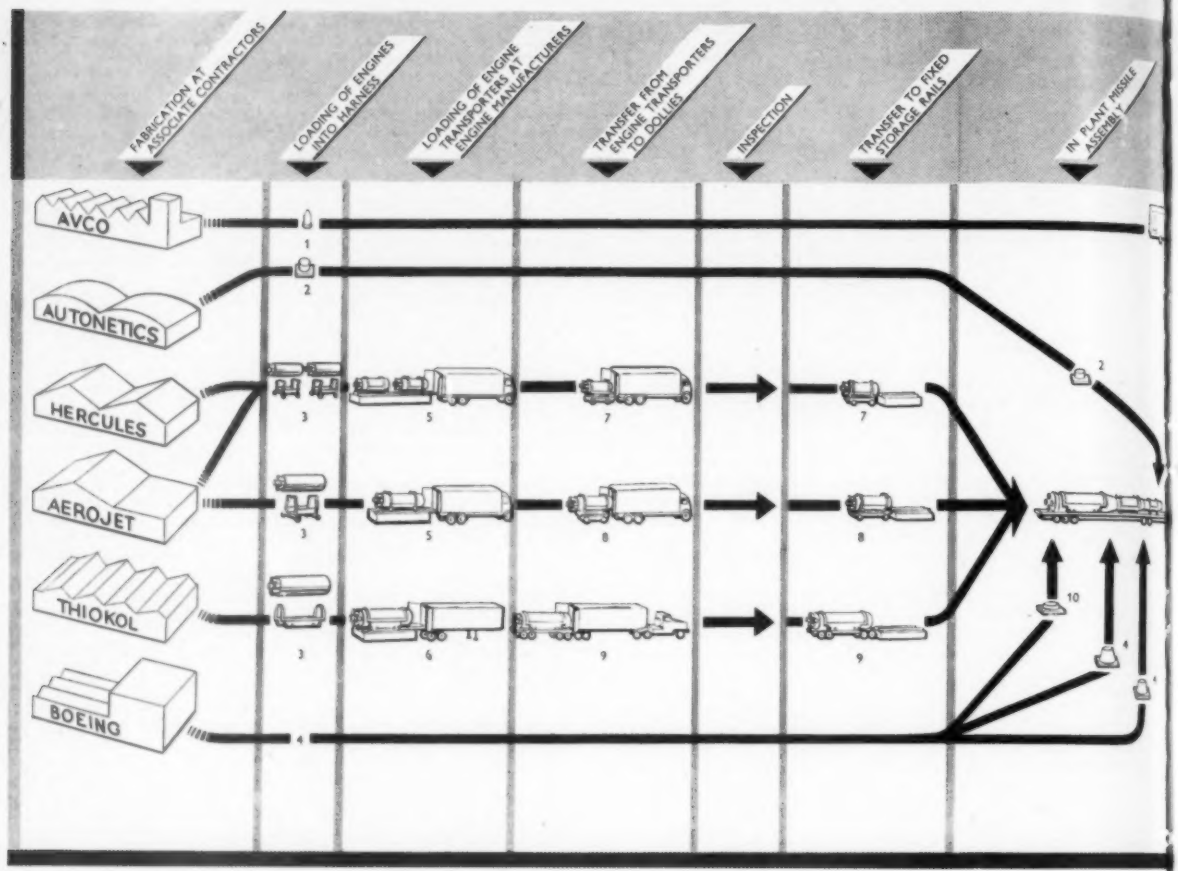
When the gear is first installed in the ship and after major refits a flying trial is carried out at sea. Records are taken of main cylinder pressure, ram stroke and aircraft retardation, and the gear performance checked against that established under test conditions. Additional problems may arise at this stage or after experience under the more exacting and intensive operational conditions, and it is only after this stage has been passed that the unit is considered fully proved and the cycle of conceiving, designing and producing a new arrester gear is complete.

THE LATEST "JANE'S"

RECENTLY published, the 1960-61 edition of *Jane's All the World's Aircraft* is the first to be compiled and edited by John W. R. Taylor, FRHists, ARAeS, well known to readers of *Flight* as a contributor to this journal and formerly the assistant compiler of *Jane's*.

In his preface, Mr Taylor pays generous tribute to his editorial predecessors, Fred T. Jane, C. G. Grey and Leonard Bridgman, and remarks on changes in the aircraft industry during the past twelve months and their reflection in the 574 pages of this new edition. Despite some gloomy prodictions about the future of the aircraft industry, there were more new aeroplanes than ever to be included this year (the aircraft section totals 413 pages, compared with last year's 403); and the newcomers are of such variety and potential that, in Mr Taylor's words, the 1960s "should prove to be the most interesting, challenging and rewarding decade in aviation history."

Mr Taylor remarks on the width of coverage, from manpowered aircraft and airships (a section which has grown this year) to supersonic deltas and ICBMs, and points out that the total of 1,176 illustrations—702 of them new—is 45 more than last year. As a result of many requests, the list of officially recognized aviation records has been reinstated. *Jane's* is published by Sampson Low, Marston & Co Ltd, Potter Row, Great Missenden, Bucks, at £5 5s net.



MINUTEMAN

The West's Biggest Missile Programme

THE first generation of ICBMs of the USAF Strategic Air Command have cost the American taxpayer something like $5,000,000,000. Bearing in mind our own rejection of Blue Streak, it might be thought that most of this vast sum had been wasted, for Atlas and Titan suffer from most of the British missile's disadvantages—and most of the first Atlas missiles are not even being put in hard emplacements (underground and protected from nuclear blast, radiation and fallout). But even if Atlas and Titan were militarily useless—which they are not—the money would have been well spent in making the Minuteman feasible.

During 1957 it became increasingly apparent that the first-generation ICBMs were far from optimum delivery systems; one high-ranking USAF officer has said "we felt there must be an easier way." This easier way crystallized as a combination of the following factors: state-of-the-art advances in all portions of the weapon system, to reduce bulk, weight, complexity and unserviceability; a slender, lightweight, ablative re-entry vehicle; a miniaturized thermonuclear warhead; miniaturized inertial guidance weighing under 300lb; high-impulse solid propellant, in a three-stage vehicle with quadruple swivelling nozzles in each stage; and fully hardened emplacement or mobile deployment. The missile was designated SM-80 and named Minuteman—after the "instant readiness" citizens of the War of Independence—and the programme was placed on a crash basis in February 1958.

Prime contract for assembly and test was placed with the Aero-Space Division of Boeing Airplane Co, and some of the other major contractors are Space Technology Laboratories (engineering direction), Thiokol Chemical Corp (first-stage propulsion), Aerojet-General (second-stage propulsion), Hercules Powder Co (third-stage propulsion), NAA Autonetics (inertial guidance, and ground-support equipment for guidance/control system and electro-mechanical nozzle actuation), Avco (re-entry vehicle and support system), AMF/ACF Industries (launch and command vehicles for mobile system), General Motors (transporter/erector vehicle), Cessna Aircraft (missile container) and Bendix (erection system).

A history of Minuteman's development was contained in our special missile review issue on November 4, 1960. At the opening of this account it was stressed that the entire programme is riding on the back of the vast foundation of technological knowledge gained with the first-generation ICBMs. Everybody con-

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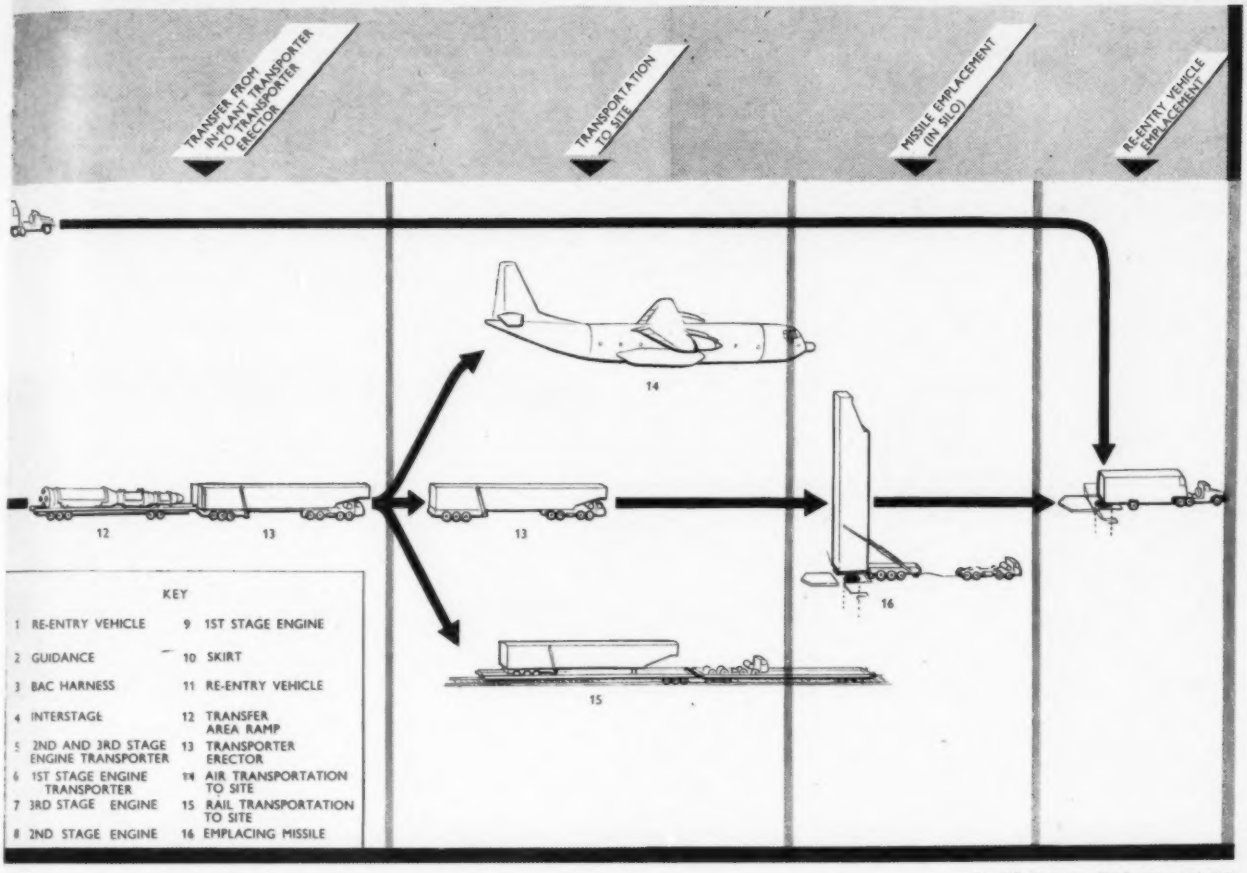

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This diagram emphasizes that, although they are overall programme manager, Boeing are not able to make very much of Minuteman themselves

cerned with the programme is doing a big job to an incredibly tight schedule; but, in contrast to the uncertainty of the development of its predecessors, it is generally not a groping march forward into uncharted regions. The techniques have often been worked out in detail in advance, the morale and confidence of everyone involved is unsurpassed and every facet of the programme seems to shout "this is how a major weapon system should be produced." Admittedly things are easier when priorities are high and money is forthcoming, but it is nevertheless worth pondering the fact that this utterly new concept has already reached the hardware stage, that the first wing (at Malmstrom AFB, near Great Falls, Montana; *Flight*, November 4, page 710) is scheduled to be operational in mid-1962, and that no fewer than 600 Minutemen are scheduled to be deployed before the end of 1964.

Boeing have kept the world very well informed of the progress of Minuteman through its various test and development phases—and well they might, since no comparable project has advanced with such rapidity. We reproduce here a selection of photographs giving a graphic indication of work so far accomplished.

Picture 1 illustrates a complete first-stage engine being shipped from the Ogden, Utah, plant of Thiokol. According to our contemporary *Missiles and Rockets*, the stage burns for some 60sec and uses "a propellant composed of polybutadiene and acrylic acid fuel, an ammonium perchlorate oxidizer and an aluminium additive to stifle unstable combustion." The propulsive jets issue from four equal nozzles, which are arranged in opposing pairs pivoted about pitch and yaw axes. The use of swivelling nozzles is claimed to be lighter than the Polaris system of fixed nozzles plus jetevators, and it undoubtedly minimimizes drag. Never before have swivelling nozzles been used on such a scale, and finding the correct design, of minimum weight, capable of withstanding the immense gas flow and temperature with utter reliability was the greatest single propulsion problem—now solved. Cases and

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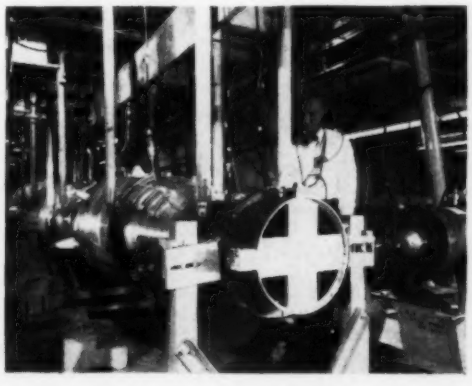
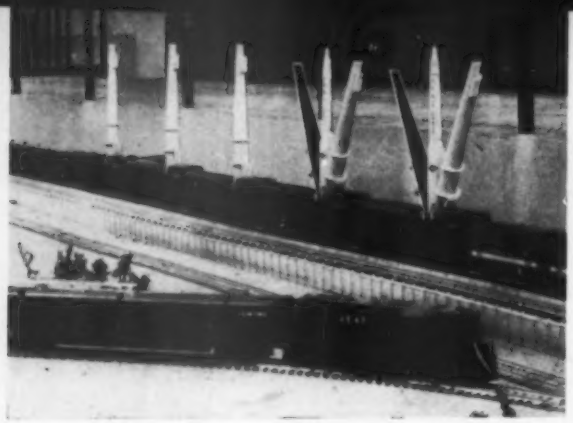


(1) First-stage engine on transporter. (2) Halo and flame from silo shot. (3) Tethered firing at Edwards AFB. (4) Instrumentation at Edwards silo. (5) Dynamic-test missile at Seattle



be essential to conduct an all-stages-empty investigation. As at present conceived 450 Minutemen will be put into silos and 150 will be carried round the US railway system in special trains. Train-borne missiles will be protected within petal covers, opened for firing. One model train has five missiles, seen elevated in Fig 6 behind the locomotive and communications car of a second train.

Fixed-base missiles will be held at almost instant readiness in lonely silos, guarded by a wire fence but devoid of human life. Launch crews (two officers) will live in underground steel capsules many miles away, inspecting the silos in their charge by helicopter from time to time (or when the alarm system warns of unauthorized entry to the site). Safe from nuclear attack for prolonged periods, the crew will know the status of each Minuteman from the master control panel. Picture 7 shows a mock-up, identical to

6

MINUTEMAN . . .

7 8 9

(6) Model of Minuteman train. (7) Command control-console mock-up. (8) Communications car of train. (9) Mock-up silo at Seattle

nozzles are made by many firms, those in the picture coming from Allison.

In the second illustration one can see the smoke halo which always shoots out of the silo ahead of the main first-stage exhaust. As the picture dramatically shows, the fierce first-stage flame fills the silo and streams out of the opening before the missile leaves. It was feared that it would severely damage the missile, and Boeing conducted 5,200 sub-scale tests to explore cold and hot flow before starting to build the first full-scale rig. Various types of W and U silo, with *ad hoc* ducts for the rocket gas, were explored before it was decided simply to dig a hole, put in a missile and fire it. At Edwards AFB on September 15, 1959, the first full-scale silo shot took place (picture 3), and the programme with this silo was so successful that the final ten of the programmed 18 shots were eliminated. Even relatively simple tests of this nature need plenty of instrumentation (picture 4).

Structural testing of the airframe was entirely Boeing's responsibility, and recent illustrations depict the dynamic-test Minuteman suspended for a test in the Minuteman Developmental Center (picture 5). Seven flight conditions were simulated: launch; 1st-stage engine part-filled, 2nd and 3rd full; 1st-stage empty, 2nd and 3rd full; 1st-stage disconnected, 2nd and 3rd full; 2nd-stage empty, 3rd full; 2nd-stage disconnected, 3rd full; 3rd-stage burnout. This work is virtually complete, but if it becomes necessary to treat structural dynamics separately from fuel dynamics it may

production panels except for variations in the number of missiles handled (20 in the mock-up). Seated at the panel is the commanding general of SAC, Thomas S. Power, and talking to him is T. A. Wilson, Boeing's Minuteman programme manager.

The concept of an ICBM fired from a train is not new, but in the Minuteman programme has reached its zenith. Ten trains will form one squadron, and each will have three to five missiles; a typical train will consist of a launch car for each missile, one or two power cars, a launch-control car, a communications car and several Pullmans for the crews. The heart of the train will be the communications car (picture 8), equipped with very powerful SSB radio and special aerial systems. It has not yet been determined whether the USAF should keep a permanently crewed locomotive on each train or whether the trains should thumb rides on the back of passing freights (a cheaper, but less controllable, method). Autonetics have developed a gyrocompass system for precise position-fixing, and missiles could be launched from any location, although for best accuracy the train would come to rest in a predesignated siding.

A major hurdle surmounted by the Minuteman system was the recent successful completion of the development engineering inspection at Seattle. In the ninth illustration Cols James H. Foster (AMC Ballistic Missile Center) and Samuel Phillips (Minuteman programme director for AFBMD) are poised with T. A. Wilson on the brink of the mock-up silo.

SINGAPORE'S NINE-DAY AIR SHOW

A NINE-DAY international air show is being held at Singapore Airport, Paya Lebar, from April 8 to 16 this year. It has been planned in conjunction with the opening of a new operations block at the airport, and as part of the "Visit the Orient Year" being organized for 1961. On three of the days, April 8, 12 and 16, there will be flying displays.

Singapore's Deputy Prime Minister, Mr Toh Chin Chye, has extended an invitation to aircraft operators and manufacturers to attend, and among countries which have already expressed interest are Great Britain, the United States, France, Germany, Holland, Japan and the Soviet Union. The SBAC is not being officially represented, but the main groups in the British aircraft industry have intimated their intention to exhibit, as have Rolls-Royce, Handley Page and Scottish Aviation. The US industry is being represented by Lockheed, Sikorsky and Bell; the Russians are sending a Tu-104; West Germany is showing radar, airfield lighting and electronic telecommunications equipment; Japan's exhibit will consist mainly of radio electronics. BOAC are showing a Comet and Boeing 707, and the RAF and Commonwealth Air Forces are participating.

All enquiries should be addressed to the Singapore International Air Show, c/o Masters (1959) Ltd, 16c Cecil Street, Singapore.

US CLAIM RECORDS

A CLAIM for a long-distance closed-circuit flight record has been made by the USAF for a B-52G which landed at Edwards AFB, Cal, recently after flying 10,000 miles non-stop without refuelling. It had taken off from Edwards at a gross weight of 480,000lb, with a crew of seven commanded by Lt Col R. Grissom, and was airborne for 19hr 45min. Previous record was 8,854 miles by a B-29 in August 1947.

The US Navy has also claimed a world record for another flight made recently from Edwards, by a North American A3J Vigilante which climbed to a height of 91,450ft (over 17 miles) with a payload of 1,000kg. Pilot and navigator were Cdr L. A. Heath and Lt H. L. Monroe. The existing record height for this load, 67,096ft, was set up by a Russian aircraft last year.

TCA VANGUARD fleet will land on Goodyear

Goodyear tyres, wheels, brakes and anti-skid equipment have been specified for T.C.A's fleet of Vickers Vanguard type 952.

GOODYEAR

AVIATION DIVISION

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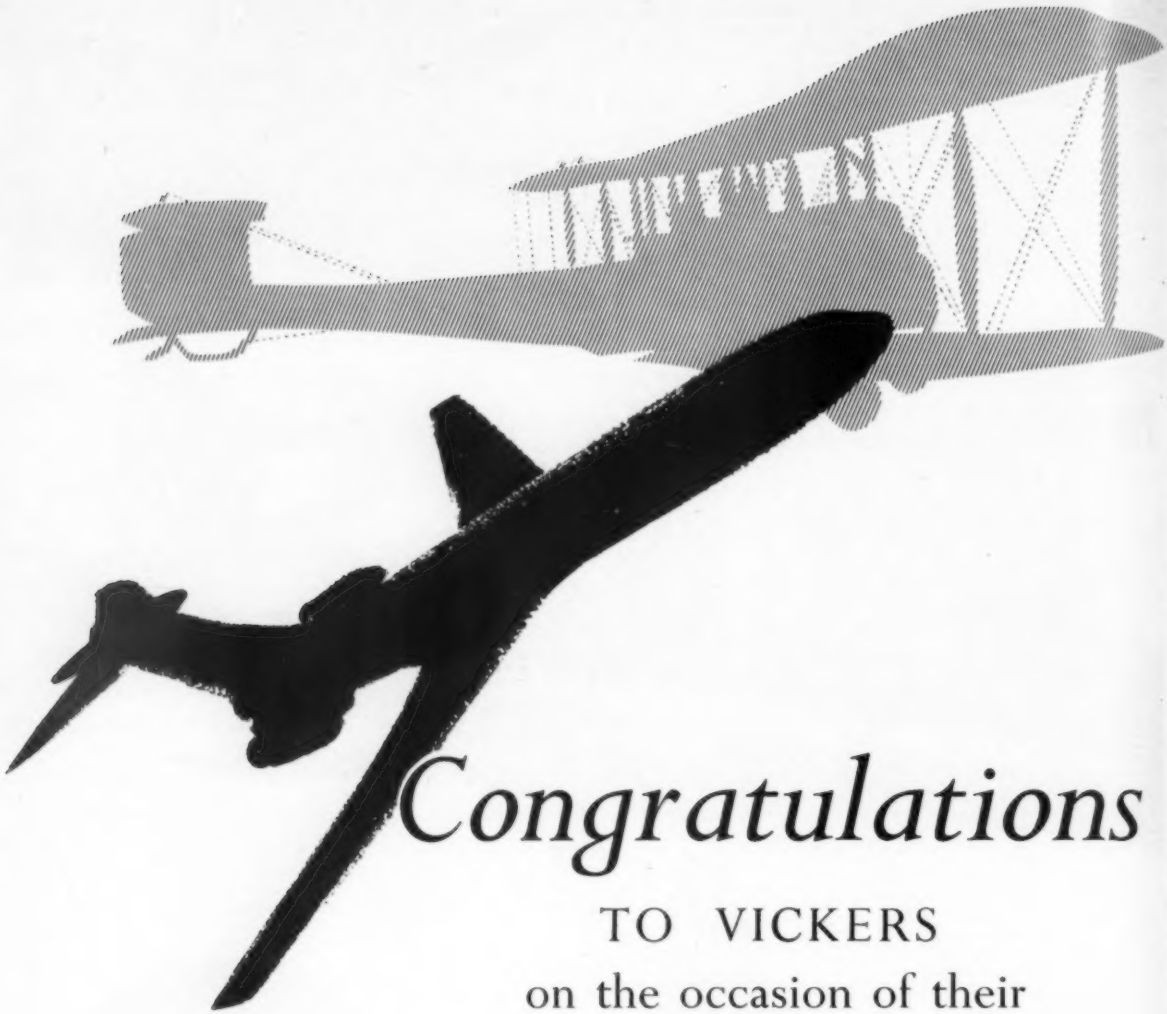

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Straight and Level

THE Swiss go to France for their third-generation jet fighter, and place an order for 100 Dassault Mirages. Their first-generation jet was the Vampire, their second-generation jet was the Hunter, both British. Switzerland's second choice, far from being a British product, was the Swedish Saab Draken. And the Australians are to buy for the RAAF not a product of the old country, but—like the Swiss—the Mirage. The Australians' second choice was the American F-104.

These are unpalatable facts. There may be good reasons why fighters good enough for the RAF are not being exported—and also why five of our allies in NATO—apart from the USA—have chosen the American F-104G. But there are other reasons for concern.

* * *

Now it is being said that two of Britain's independents, Cunard Eagle and British United Airways, want Boeing 707s. There may be good reasons why these British airlines' needs cannot yet be met by our own manufacturers. But BEA too have had an American aircraft, the Boeing Vertol 107, at the top of their shopping list. They will not be allowed to import it, but there it is: an American helicopter is the first choice of a British airline.

We *are* selling our new aircraft, as SBAC figures show—118 transports in 1960. But what the SBAC figures do not show is that we are selling too high a proportion of them—91 out of 118—to ourselves.

Generalizations about the reasons for all this are apt to be dangerous, and in any case nationalism in aircraft manufacturing must nowadays be sublimated to internationalism. But there is one question we must always ask ourselves: do British operational requirements necessarily breed aircraft that will find a ready export market?

● A day or two after the tragedy over New York, the head of the US Federal Aviation Agency, Mr E. R. Quesada, published the transcript of the conversation between the La Guardia and Idlewild air traffic controllers.

In this country all the parties concerned with an accident suppress all evidence as *sub judice* pending an inquiry. But Mr Quesada's action was typical. I quote him in another context: "*The whole philosophy of government regulation is to protect the public's interest. History finds the public is silent; the public sits there and just hopes that the agency that it set up will take care of its interest.*"

Whether or not publication of the transcript concerned was in the public interest may be a matter for controversy. But, as a general rule, there are more abuses in secrecy than there are in frankness and public accountability.

"Now my next trick . . ." There is something rather symbolic about this picture of Sir Frederick Handley Page: the backcloth could represent the turbulent airflow which, H.P. has been saying for years, can be smoothed out with boundary layer control. Anyway, we can take comfort in the fact that the flowers at the foot of the dais do not conceal the coffin of BLC, and that the apparently decapitated audience is not really as mournful as it seems

● Mr Quesada's later statement, to the effect that one of the airliners appeared to be off course, was described by the US Air Line Pilots Association as "irregular and improper." Mr Quesada, ALPA said, should have refrained from "speculation which could be very harmful to innocent parties." His statements were "an irregular abuse of public office."

Well, this is a domestic squabble (some would say a private feud) which isn't for me to sort out. But I cannot help envying a system which rejects the timorous doctrine of "chaps, don't let's have a slanging match in public."

The only man in this country who gets up and says what he thinks, right or wrong, is Lord Brabazon. Even if he is sometimes wrong, at least he makes people stand up and say why they are right. The more slanging matches there are in public, provided the contestants are well informed, the better is the public interest served.

● BOAC has strengthened its position in the Middle East by co-operating with Middle East Airlines. Both airlines operate Comets.

BEA likewise has strengthened its position in the Middle East (where there is a conflict of interests between BEA and BOAC) by co-operating with Olympic Airways. Both airlines likewise operate Comets.

Is it too much to hope that, one day, we shall see BOAC and BEA co-operating with each other?

● Still defending my mother tongue against the onslaught of Americanisms and modish aeronautical neologisms, I have started a collection of what I might call fogey words—old aeronautical words, antiques to be treasured, cherished and preserved. They are used by people who, though not necessarily old fogies, contemptuously reject such terms as avionics, navaids, and so on.

Such people, who are definitely "in," do not talk about London Airport—they refer to Heathrow. They talk about machines, or flying machines. To them an airport is an aerodrome, gear is undercarriage and radio is wireless. Air routes are air communications or, better still, Imperial air communications.

Any other fogey words for my collection?

ROGER BACON

Why, the airlines ask, does Britain keep on increasing airport landing fees? Why, they ask again, cannot they have more control over airport expenditure? Here is one typical piece of Ministerial extravagance: this little road off the southern perimeter track at London Airport is lavishly placarded with two enamelled signboards proclaiming it to be Beacon Road (could it be anything else?). Two other signs tell us, in effect, to mind our own business

Sport and Business

THE NEW FRENCH GY80 FOUR-SEATER has now completed its initial flight tests and is being submitted to the French flight test centre for certification to French and American CAR 3 standards. Powered by a Lycoming O-320 150 h.p. engine with fixed-pitch or optional constant-speed propeller, the GY80 has been designed by Max Gardan, formerly chief designer of Sipa, and externally resembles the Piper Comanche. Structure is all-metal, based on a steel-tube central frame enclosing the cabin, and providing mountings for engine, undercarriage, wings and tail. The tube frame is covered with unstressed metal skin, the wing and rear fuselage being of riveted stressed-skin employing some new techniques.

During the design stage, exhaustive wind-tunnel tests were made and each structural item was designed in two or three different ways to discover the most effective method from the weight, strength, producibility and replacement points of view. The production press dies and jigs were then made up and the prototype produced from them. In order to reduce cost, a single surface is used for both ailerons and flaps, two for the former and four for the latter. The halves of the slab tailplane and fin are also identical, an anti-balance tab or dorsal fin and rudder being added as appropriate. The nosewheel undercarriage is retracted by a single mechanical linkage actuated by an electric motor or by stand-by hand crank. Disc brakes are on the mainwheels, the components being mainly automotive parts, and the nosewheel is connected to the rudder pedals for steering on the ground. All three tyres are the same size. Automotive parts are also used for engine and electrical instruments and for interior trim.

The cabin can accommodate three grown-ups and two children, or four grown-ups, with a baggage allowance of 75lb and full tankage of almost 36 Imp gal. The car-type side door on each side of the cabin extends right down to the wing skin. Navigation and communication radio can be fitted and controllable hot and cold air supplies and demisting are standard. There is a separate baggage compartment as well as stowage for handbags in the cabin and a map pocket on each side. Basic flight instruments are standard, but a full panel and night-flying lighting are optional.

Span and length are respectively 31ft 9in and 21ft 5in. Empty and gross weights are 1,185lb and 2,200lb, giving a power loading of 14.8lb/h.p. The prototype first flew on July 21 last year and a second machine should be completed soon. Measured performance so far has shown a speed at 75 per cent power of 156 m.p.h. and of 149 m.p.h. at 66 per cent power, both at 6,600ft. Stalling speed is 53 m.p.h. Initial climb is 890ft/min and take-off distance to 50ft, 1,210ft. Extreme range at 66 per cent power is 685 miles and consumption 20 m.p.g. The first GY80 will be delivered in June, then five per month from September.

The price will be 66,000NFr (about £4,930) for the standard model.

Georgeson in his Skylark 3F over the New Zealand coast near Christchurch. This pleasing study was used by Mr and Mrs Georgeson as their Christmas card, one of the recipients being Philip Wills

A NEW GAIN-OF-HEIGHT world record for single-seater gliders was set up by a New Zealander, S. H. Georgeson, at Christchurch, New Zealand, on December 18 when he flew a Slingsby Skylark 3F to an absolute height of 35,200ft, climbing 34,000ft after release. This gain of height betters by more than 2,000ft the present world record of 9,665m (31,709ft) set up by a German, Karl Bauer, in a Weihe on June 20 last year. The new record is, of course, still subject to confirmation. The Skylark 3F in which it was set up is the one flown by Anthony Deane-Drummond in the 1960 World Championship competition, held last June at Butzweiler in Germany.

Very like the Piper Comanche, but smaller and only half as expensive, the new French GY80, described in col 1, cruises at 156 m.p.h. with four occupants, full fuel and baggage. Production begins this summer

THE FIRST MAJOR EXPORT ORDER for Australian designed and built light aircraft has been gained by the newly formed aircraft division of Victa Consolidated Industries in Sydney, who have received a £50,000 order from the Royal Aero Club of Auckland, New Zealand, for ten aircraft—six Victa Air Tourers and four Victa R-2s. The Tourer is a single-engined, two-seater low-wing monoplane with fixed nosewheel undercarriage, cruising at 105 m.p.h. The R-2 is a single-engined four-seater cruising at 180 m.p.h. It is stated that with full payload and taking off into a 5 m.p.h. wind, the R-2 needs a take-off run of only 540ft.

QUANTITY PRODUCTION of the KhAI-17 (Kharkov Aviation Institute), which made its first flight last year, is reported from the Soviet Union. The machine has a 30 h.p. engine, weighs 300kg (660lb) including the pilot, has a ceiling of 2,500 metres (8,200ft), a top speed of 93 m.p.h. and a range of "several hundred kilometres." The Institute design office is now working on a two-seat version with 50 h.p. engine.

THE STOCK of Piaggio aircraft spares held by McAlpine Aviation at Luton Airport is being increased to a value of £30,000. This follows a recent visit to the Piaggio organization by Mr Ray Young, aviation manager of the McAlpine Co. At Luton, McAlpine are the UK servicing agents for Piaggio P.166 aircraft, and have introduced a comprehensive business flying advisory service. Sir Robert McAlpine & Sons Ltd have operated their own business aircraft for the past 14 years.

SPEAKING to a meeting of the US National Aviation Trades Association, Mr James T. Pyle, deputy administrator of the FAA, said recently that the agency's Bureau of Research and Development was undertaking the design and development of an airborne transceiver for light aircraft. The primary objective of this development would be a production and selling cost comparable to present 90-channel general aviation equipment, while still meeting full stability, power output and channel spacing requirements. It will provide the pilot with all 360 channels between 118 and 136Mc/s on a faster selection basis, permitting full application and use of 50kc/s channel spacing.

BELL HELICOPTERS FOR 1961 will all be cheaper and incorporate many improvements in design and performance. Already certificated is the new three-seat Model 47G-2A, which has a new rotor head and longer tail boom, considerably improving control and allowing a 37 per cent increase in payload. The new gross weight is 2,850lb and the powerplant is a Lycoming VO-435 giving 240 h.p. maximum and 220 h.p. continuous. Maximum speed is 105 m.p.h. and hovering ceiling in ground effect, 4,500ft. Rotor blades, main rotor hub, transmission and many detail parts are interchangeable between the three models, and the only difference between the G-2A and the G-3 is the engine, the G-3 having the Franklin 6VS-335A turbosupercharged unit giving 220 h.p. continuous and 240 h.p. maximum. Gross weight is the same, but payload is increased by 200lb and high-altitude performance should be much better.

The Model 47J-2 will have the Lycoming VO-540 engine giving 260 h.p. maximum, instead of 240 h.p., and 220 h.p. continuous. New paint finishes and better interiors, plus optional custom interiors for the 47J-2 Ranger are, of course, included in the new line. All will be available early this year. The 47Gs can also carry a full range of landing gears and attachments for a wide variety of operations.

FLIGHT SYSTEM SURVEY

Land-mass radar simulator made by ACF Electronics and used for familiarizing pilots with the radar view of treacherous terrain before low-level missions. Light is projected down the tube to illuminate as much of the terrain model as would be covered by the search radar

Flight Recording all the Time

THE Federal Aviation Agency has now proposed that flight recorders should be mandatory in all turbine-powered flying and not only during scheduled passenger services. All turbine-powered aircraft weighing more than 12,500lb, whether turboprop- or turbojet powered and aircraft of this kind with provisional certificates of airworthiness should have recorders on all flights. At least the five basic parameters of speed, height, course, vertical acceleration and time are to be recorded, but there is strong feeling that engine performance and a great number of additional parameters from systems should also be added.

The five-channel recorders have already proved to be of considerable help in incidents, as distinct from accidents, in defining the flight-path of the aircraft in such cases as strong turbulence from which passenger injuries have resulted, or in reported near misses. A logical extension, and one already well appreciated in Britain, is the use of recorded information in assessing the actual wear on major components from the servicing point of view. Recorders could also be applied to pre-flight checking by recording the performance of a complex system and allowing an assessment of its serviceability before the next flight without specific testing. Statistical analysis in service, using accumulated tape records, is also possible.

The FAA has asked for comments on its latest rule by the end of this month.

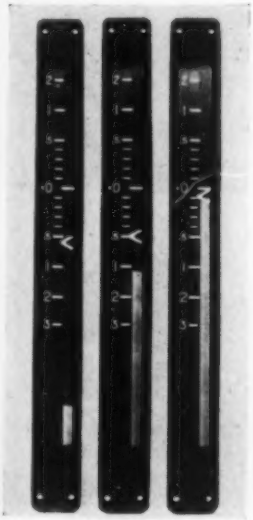
Equipment on Order

SEVERAL new orders and deliveries of British equipment have recently been announced. BEA Vanguards, at least three of which have now been delivered, are the first civil airliners fitted with the new Ekco Electronics transistorized weather radar. This equipment has also been ordered for the Argosy freighters for RAF Transport Command and is fitted in the Comet 4Cs of Middle East Airlines. The first of four MEA Comets is due to go into service today, January 6.

These aircraft also carry an extensive range of Standard Telephones & Cables radio equipment, including STR 23 VHF radios with 360 transmitting and 560 receiving channels; SR 34/35 VOR instrument drive unit and ILS glide-path receiver working with an SR 23; SR 36 marker-beacon receiver; STR 18C 100-channel HF transmitter/receiver; and SA 10/11 loudspeaker and intercom system.

Under a contract worth about £100,000, Ultra Electronics are to supply the new UA60 transistorized, push-button intercom system, cabin address and cockpit address system for the 35 Vickers VC10s ordered by BOAC. The UA60 has also been specified for the Britannic, Beaver, P.531, Avro 748 for Skyways and BKS, Herald and Wessex 2. Ultra have received an order from the RAAF for a further supply of Sarah search and rescue beacons, with speech facility, to a value of about £9,000.

Bahrein, in the Persian Gulf, has now been equipped with Pye ILS incorporating uni-directional localizer. More than 100 airfields now have Pye ILS.



Three indications of the landing altimeter and rate of descent indicator produced by Lear and described on this page on December 2. The rate pointer can be seen at 600ft/min, 500ft/min and at 80ft/min in the three views, with the height tape showing descent towards touchdown. The pilot in theory maintains both indicators coincident but, according to BLEU researches, this would not give a suitable flare-out path

Semi-Automatic Navaid Checking

THE use of 26 or 43 separate navigation receivers to take continuous bearings from as many VOR beacons while an aircraft flies a grid course has been proposed by Airborne Instruments Laboratory for checking these aids in the US. The airborne system, which weighs 500lb, flies the aircraft automatically on a course pre-computed by tape on an IBM computer. In this way a single aircraft can check beacons along a stretch of country between 80 and 160 miles wide instead of having to fly orbits or series of radials at each beacon in turn.

All the airways beacons in the US could be checked in four months by this method, and results from each flight would be computed and printed out by the IBM 704. All five of the FAA's Convair 440 navaid checking aircraft are to be fitted with the equipment during this month.

More F-104 Simulators

A BELGIAN order has now been added to those from Germany and Holland for F-104G simulators from Canadian Aviation Electronics. The RCAF has also ordered simulators for the CF-104 from the same company. There will be six for the RCAF, four for Holland, sixteen for Germany and two for Belgium, the total value being about $25 million. The German and Dutch orders were recorded in these columns on September 23: an order from Italy, which is now to build 200 F-104Gs, might be expected.

Automatic Approaches for Dart Heralds

IT has now been announced that the Sperry Flight Director Gyropilot has been made standard equipment for Handley Page Dart Heralds, six of which have been ordered for Jersey Airlines and three for BEA. The Flight Director Gyropilot consists of the AL.30 with Zero Reader, the combined equipment weighing only 30lb installed. The second prototype and first production Heralds carried the Gyropilot during 750hr of world-wide demonstration tours. No spares were carried, except for the routine filter element change.

AL.30s have already flown thousands of hours in Doves, Herons, Princes and Noratlas and are shortly to be installed in the Dornier Do 27 and Piaggio P.166. The AL.30 is offered as standard equipment for the Fokker Friendship.

ILS for Rotterdam

AN ILS installation serving Runway 24 at Rotterdam Airport was handed over to the Dutch directorate of civil aviation shortly before Christmas. It is an ILS-3 designed by International Telephone and Telegraph Corp and made by ITT's Italian subsidiary, FACE of Milan. The localizer transmitter is in an underground hut, and there are three marker beacons and monitor and control equipment. Permission has also been given to extend the runway from 4,200ft to 5,500ft, making the airport capable of accepting larger aircraft. Two new navigation beacons are to be installed next summer on the islands off the south-west Dutch coast. Rotterdam is at present served by KLM, Channel Airways, BUA and BKS as well as being used by business and charter aircraft. Approach control was formerly based on two NDBs and VDF.

Another Pictorial Presentation

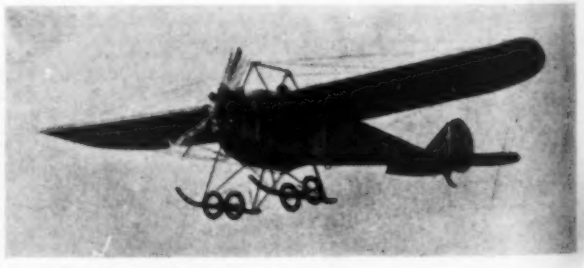
SEVERAL pictorial presentation systems using VOR have from time to time been demonstrated in the US. The latest is the Vortac Pictorial Display developed by International Telephone and Telegraph Corp and shown at Teterboro recently. The 13lb unit contains 20 maps, presumably able to operate from 20 pairs or 20 single Vortac beacons. The relatively low accuracy of VOR has always made navigation computers for this aid difficult to design. The accuracy of this further pictorial aid is not stated.

Vickers' Golden Jubilee

A PICTORIAL TRIBUTE TO A GREAT COMPANY

Of all the great families of aircraft, none has a more remarkable history than that which we relate pictorially in the following pages, commemorating the 50th year of Vickers aircraft. These pictures—148 of them—represent an astonishing range of types and variants; yet no claim is made for completeness by reason of the complexity, and sometimes obscurity, which is so characteristic of the Vickers lineage. Though some of these aircraft are truly household words (notably the Vimy, Wellington and Viscount) there are many that will, we believe, be quite unfamiliar to most readers. Several of the pictures are published for the first time. In each instance the type of engine fitted is given in parentheses.

No 1 Monoplane (R.E.P.) 1911



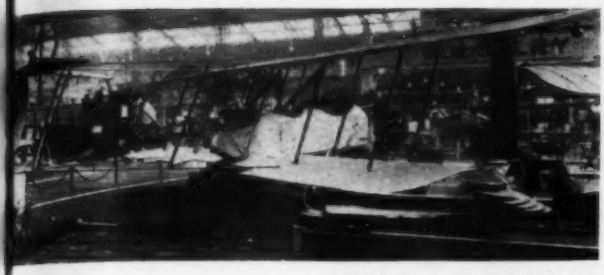
No 5 Monoplane (R.E.P.) 1912

No 6 Monoplane (Viale) 1912

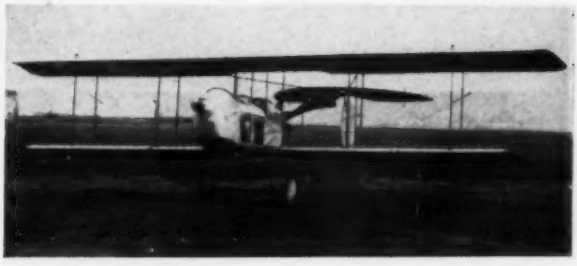
No 7 Monoplane (Gnome) 1912

No 8 Monoplane (Gnome) 1912

Boxkite (Gnome) 1912



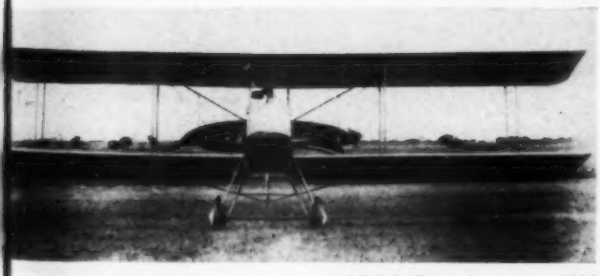
E.F.B.1 Destroyer (Wolseley) 1913



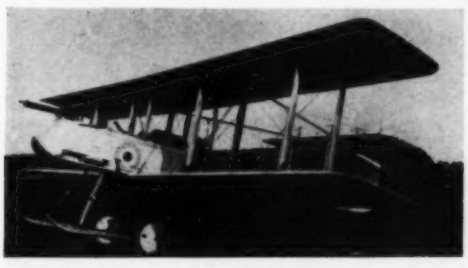
E.F.B.2 (Gnome) 1913

E.F.B.3 (Gnome) 1913

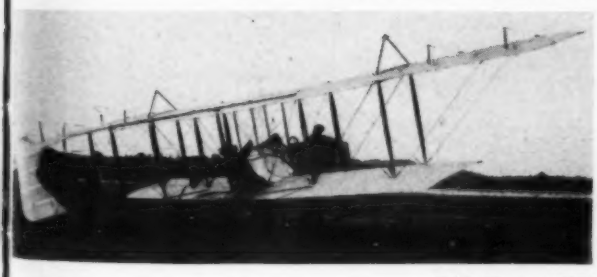
E.F.B.4 (Gnome) 1914



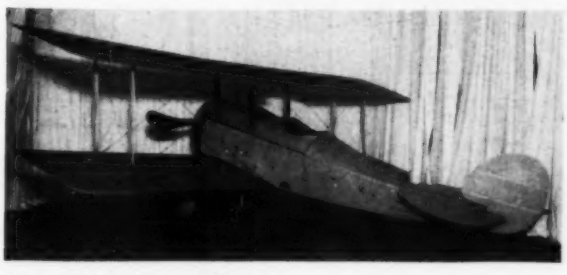
E.F.B.5 (Gnome) prototype 1914



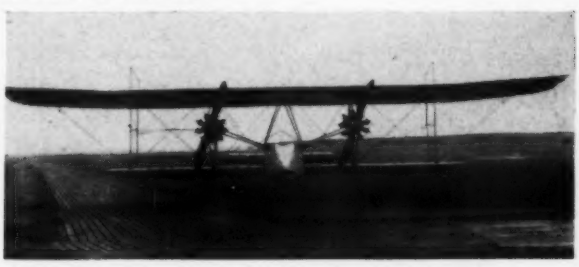
F.B.5 (Gnome) with modified nacelle 1914



F.B.6 (Gnome) 1914
F.B.5 (Gnome) (production) 1915



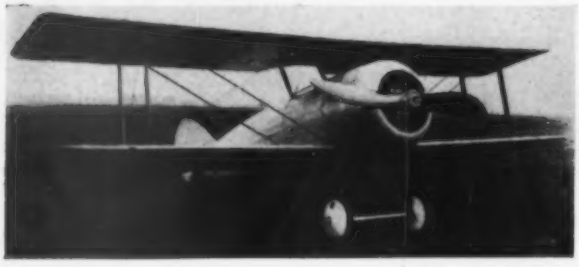
Tractor biplane (Gnome) 1914
F.B.7 (two Gnome) 1915



F.B.7 (two Gnome) with cowled engines 1915

F.B.8 (two Gnome) 1915

Vickers' Golden Jubilee . . .



E.S.1 (Gnome) 1915

E.S.2 (Clerget) 1915

F.B.9 (Gnome) 1916

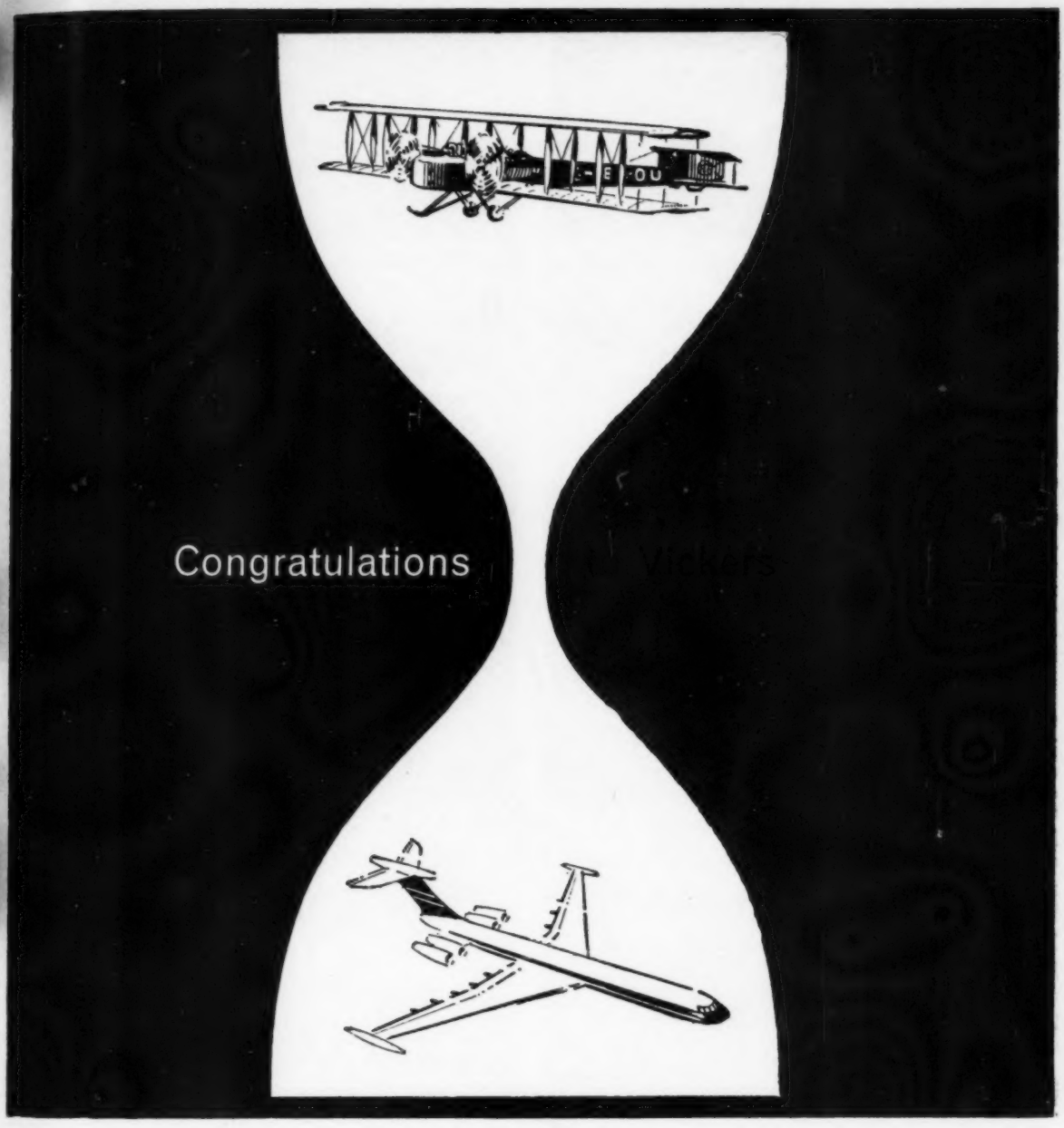
F.B.11 (Rolls-Royce) 1916

F.B.12 (Gnome) 1916

F.B.14 (Beardmore) 1916

F.B.16 (Hart) 1916
F.B.24C (Lorraine-Dietrich) 1916

F.B.19 Mk II (Clerget) 1916
F.B.16C (Lorraine-Dietrich) 1917



On the occasion of the Fiftieth Anniversary of Vickers' entry into the age of flying machines, The Plessey Company Limited offer their warm congratulations to Vickers-Armstrongs (Aircraft) Limited and look forward to their next half-century of progress.

Plessey, who have long contributed to the success of Vickers' aircraft . . . the Viking, the outstandingly successful Viscount, the Valiant, the Vanguard—soon the VC 10—will continue to offer the finest electrical systems and equipment for the world's aircraft.

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THE PLESSEY COMPANY LIMITED
Ilford · Essex Telephone: ILFord 3040
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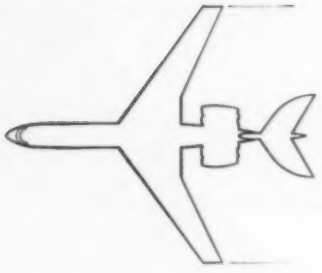
Plessey

A103



Quality and design in times of peace and war have always been the Hallmarks of the many famous aircraft produced by VICKERS.

We at Boulton Paul Aircraft Ltd. are proud to have witnessed these achievements and look forward to continued co-operation as the century advances.

Congratulations to ~

VICKERS

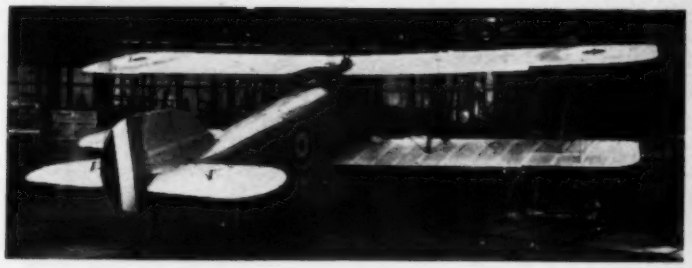
on the occasion of their

GOLDEN JUBILEE

BOULTON PAUL AIRCRAFT LTD

WOLVERHAMPTON ENGLAND

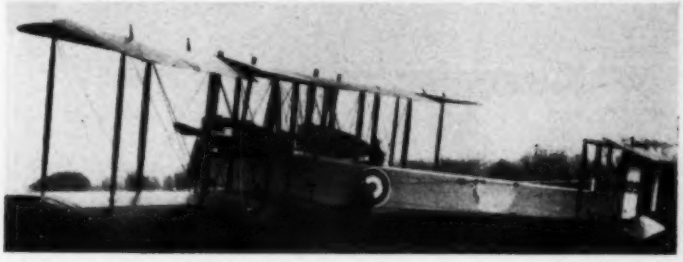
F.B.16D (Hispano-Suiza) 1917



F.B.16E (Lorraine-Dietrich) 1917

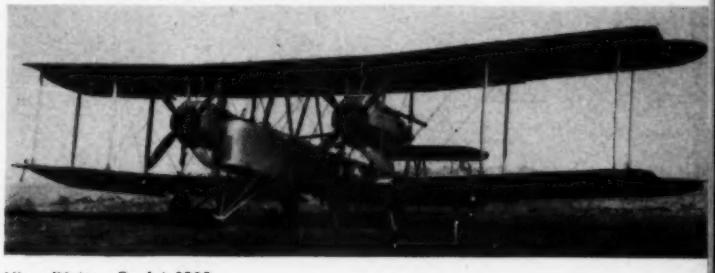
Vickers' Golden Jubilee . . .

F.B.26A Vampire Mk II (B.R.2) 1918



F.B.27 Vimy prototype (two Hispano-Suiza) 1917

Civil F.B.19 Mk I (Le Rhone) 1919



Vimy IV (two Eagle) 1918

Vimy IV (two Eagle) for Australia flight 1919

Vimy IV (two Eagle) with COW gun 1919 (?)

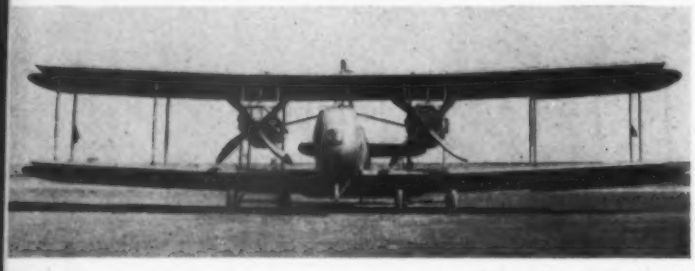
Viking I (Falcon) 1919
VIM (Eagle) 1920

Vimy Commercial prototype (two Eagle) 1919
Vimy Ambulance (two Eagle) 1919

Vickers' Golden Jubilee . . .

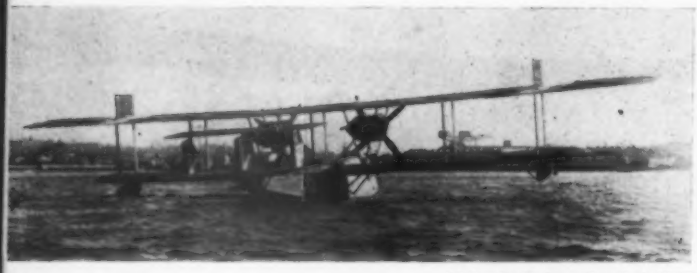
Viking III (Lion) 1920

Viking IV (Lion) 1921

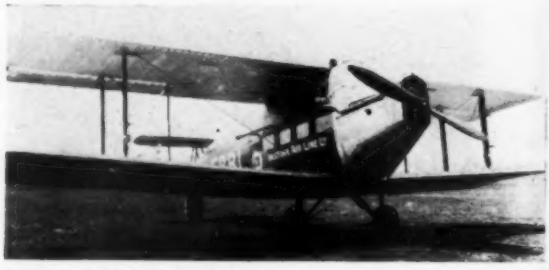


Vernon I (two Eagle) 1921

Viking IV (civil) (Lion) 1921



Valentia II (two Condor) 1922



Vulcan prototype (Eagle) 1922

Vanguard (two Lion) 1922

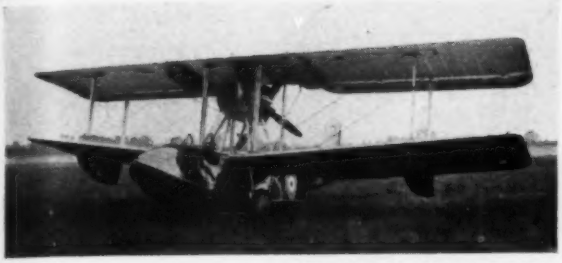
Vulcan (Lion) 1923

Vixen II (Lion) 1923
Virginia I (two Lion) with "fighting tops" 1923

Vernon II (two Lion) 1923
Vixen III (Lion) 1923

Viget (Douglas) 1923

Valparaiso (Lion) 1923



Viking VII (Vanellus) (Lion) 1923

Virginia III (two Lion) 1923

Vagabond (Cherub) 1924

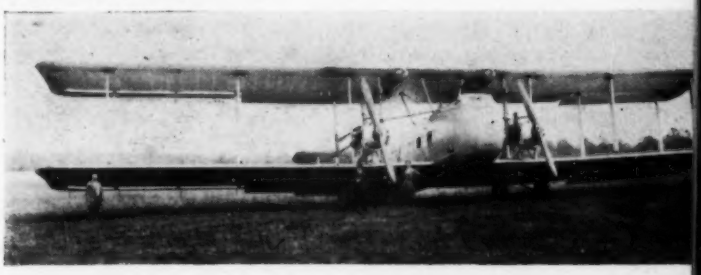
Vulture (Lion) 1924

Venture (Lion) 1924

Vanguard (two Condor) 1925

Wibault Scout (Jupiter) 1926
Vixen V (Lion) 1926

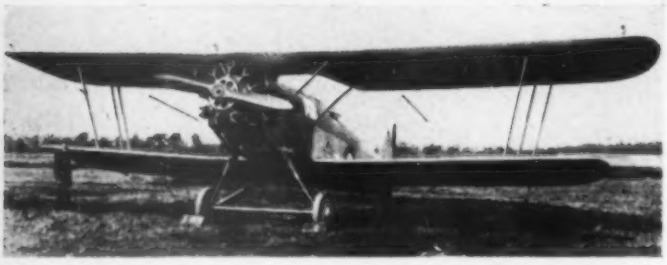
Vendace I (Falcon) 1926
Victoria III (two Lion) 1926



Vickers' Golden Jubilee . . .

Type 123 (Hispano-Suiza) 1926

Vivid (Lion) 1926



Valiant (Jupiter) 1927

Virginia VII (two Lion) 1927

Virginia VII (two Lion) with "fighting tops" 1927

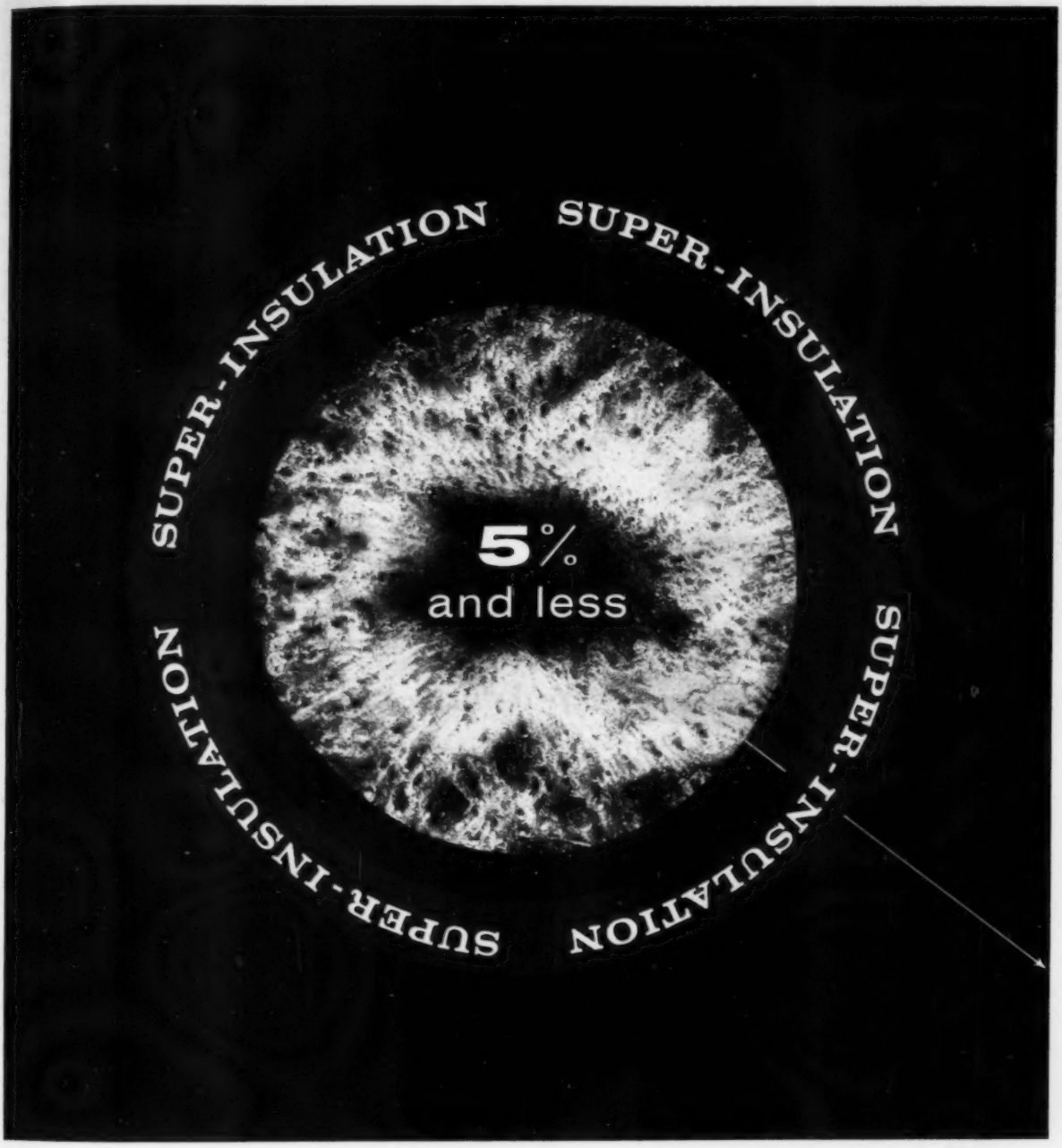
Vireo (Lynx) 1927

Vendace II (Nimbus) 1928

Vendace II floatplane (Nimbus) 1928

Vellore I (Jupiter) 1928
Vellore II (Jaguar) 1928

Type 141 (Rolls-Royce F.XI) 1928
Vivid floatplane (Lion) 1929



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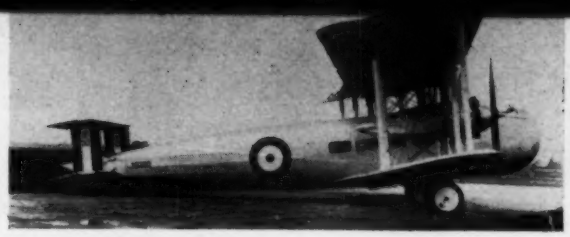
Type 143 (Jupiter) 1929

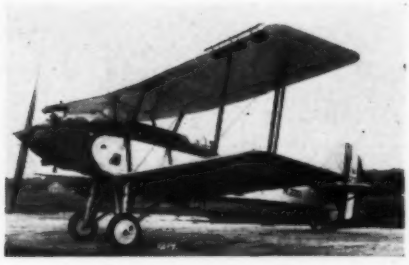


Victoria (two Jupiter) 1929

Type 151 (Mercury) 1929

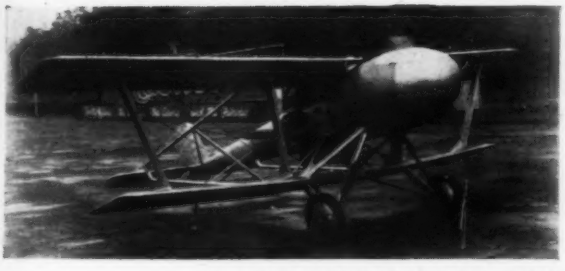
Virginia IX (two Lion) 1929

Vickers' Golden Jubilee . . .



Vildebeest prototype (Jupiter) 1929

Vellore III (two Jupiter) 1930

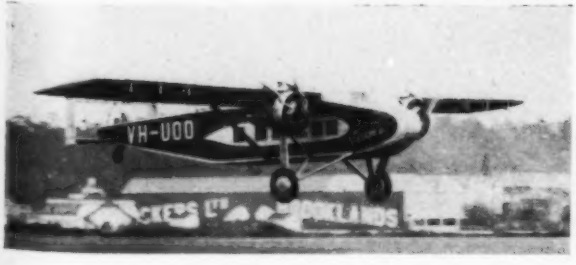


Type 161 (Cow Gun Fighter) (Mercury) 1930

Type 177 (Jupiter) 1930

Vespa VI (Jupiter) 1931
Viastra II (two Jupiter) 1931

Type 150 (B.19/27) (two Kestrel) 1930
Vespa IV (Jaguar) 1931

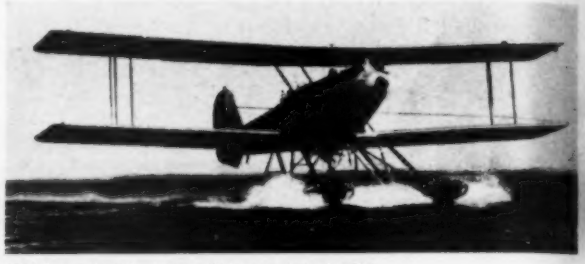


Vickers' Golden Jubilee . . .

Viastra III (two Jaguar) 1931

Vildebeest VII (Hispano-Suiza) 1931

Type 163 (four Kestrel) 1931

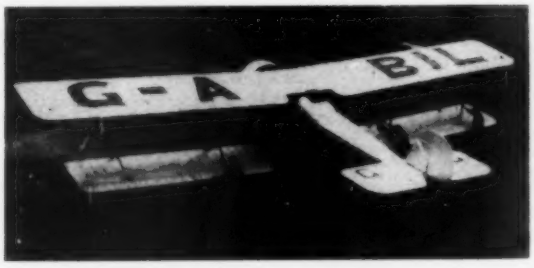


Vildebeest VII floatplane (Hispano-Suiza) 1931

Viastra VI (Jupiter) 1932

Jockey (Jupiter) 1931

Viastra VIII (three Jupiter) 1932



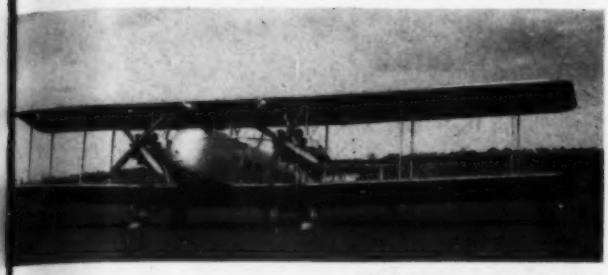
Vespa VII (Pegasus) for altitude record 1932

Type 195 Vannock (two Pegasus) 1932
Viastra X (two Pegasus) 1933

Vellore III floatplane (two Jupiter) 1932
Type 207 (M.1/30) (Buzzard) 1933

Vellox (two Pegasus) 1934

Vildebeest I (Pegasus) 1933

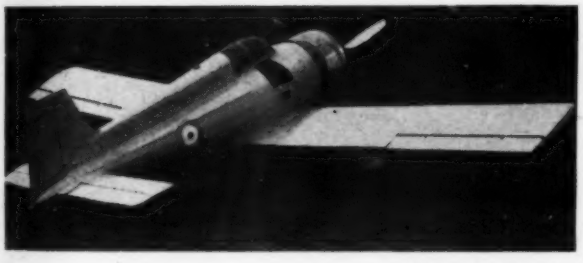


Valentia (two Pegasus) 1934

Type 253 (G.4/31) (Pegasus) 1934

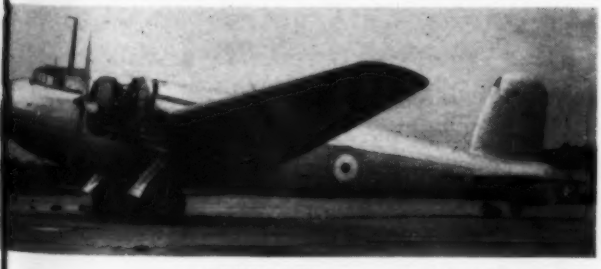
Wellesley prototype (Pegasus) 1935

Vincent (Pegasus) 1935



Venom (Aquila) 1936

Vildebeest I floatplane (Pegasus) 1936



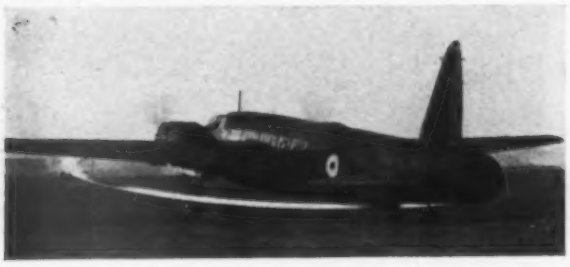
B.9/32 (Wellington prototype) (two Pegasus) 1936
Wellington I (two Pegasus) 1937

Vildebeest IV (Perseus) 1937
Wellesley (Pegasus) 1937

Wellesley (long distance) (Pegasus) 1938

Warwick (second prototype) (Centaurus) 1940

Vickers' Golden Jubilee . . .



Wellington I D.W.I. Mk 1 (two Pegasus) 1940

Wellington II (two Merlin) 1940

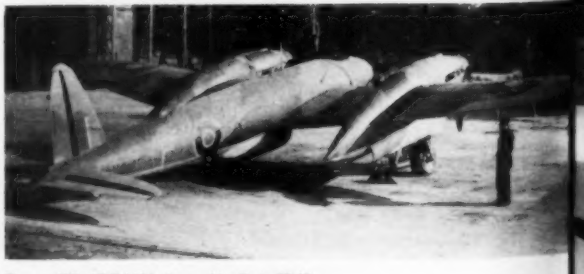
Wellington III (two Hercules) 1941

Wellington with 40mm gun (two Merlin) 1941

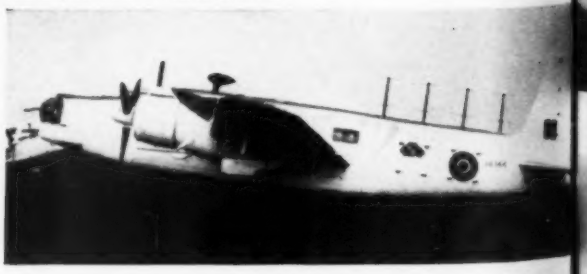
Wellington V (two Hercules) 1941

Wellington with 40mm gun and revised tail (two Merlin) 1941

Wellington II (two Merlin) with Whittle W.2b/23 1942
Wellington VI (two Merlin) 1943



Type 432 (F.7/41) (two Merlin) 1942
Wellington G.R.XI (Hercules) 1943



Warwick I transport (two Double Wasp) 1943

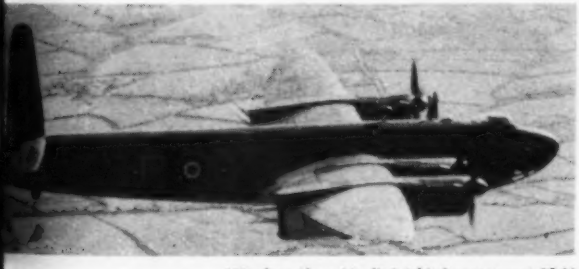
Warwick (two Double Wasp), nacelle turrets, 1943

Wellington XV (two Pegasus) 1944

Warwick I (A.S.R.) (two Double Wasp) 1944

Warwick G.R.V (two Centaurus) 1944

Windsor (four Merlin) (second prototype) 1945



Windsor (four Merlin) (third prototype) 1946

Viking Ib (two Hercules) 1946

Wellington test-bed (two Dart) 1948
Nene-Viking (two Nene) 1948

Valetta C.2 (two Hercules) 1948
Viscount prototype (four Dart) 1948

Vickers' Golden Jubilee . . .

Varsity prototype (two Hercules) 1949

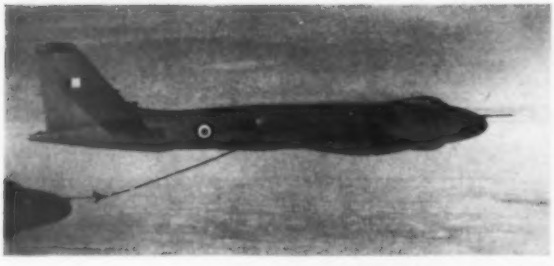
Viscount 700 prototype (four Dart) 1950

Valiant prototype (four Avon) 1951

Tay-Viscount (two Tay) 1950

Valiant B.2 (four Avon) 1953

Valiant B.1 (production) (four Avon) 1953



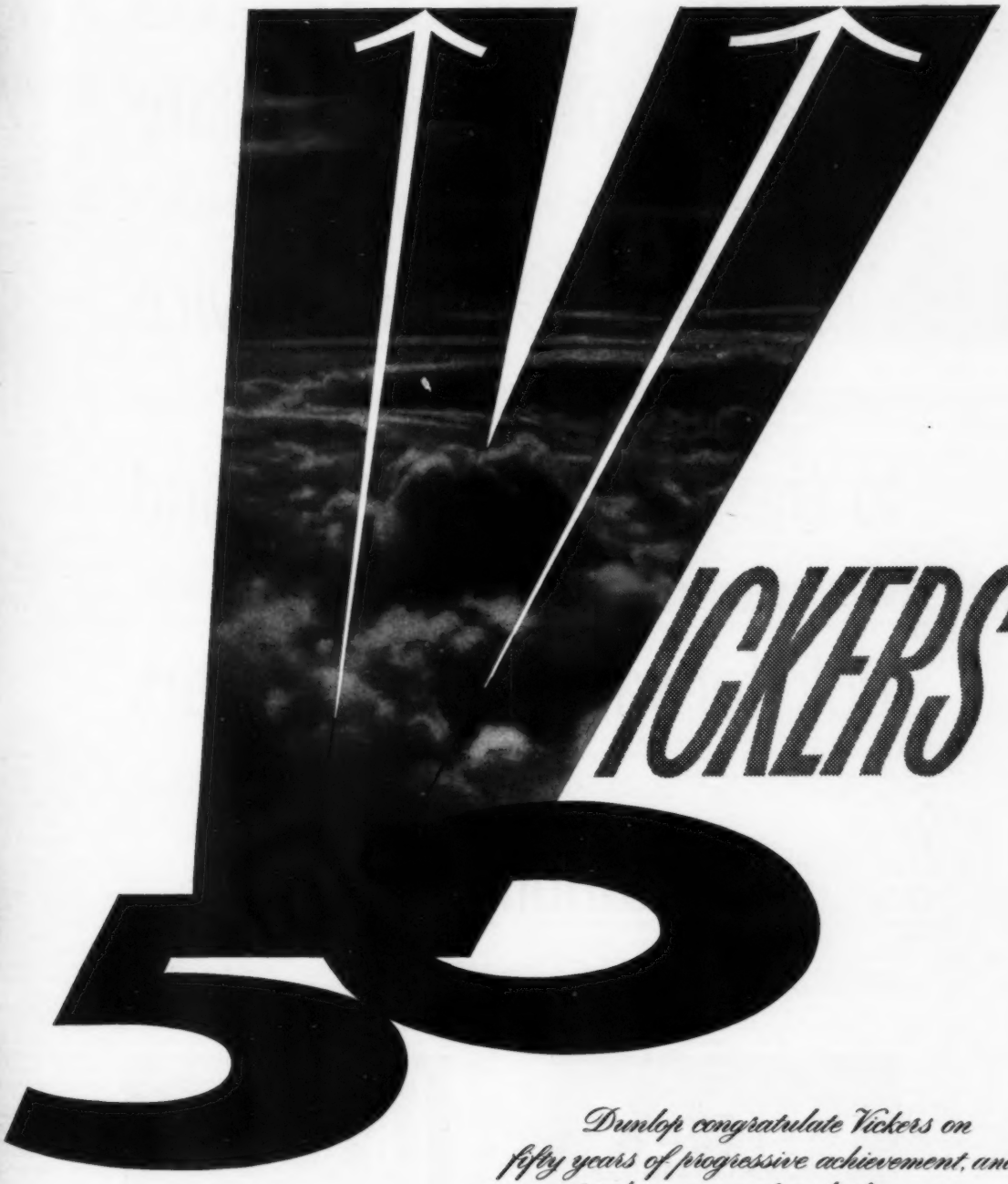
Valiant B(K).1 (four Avon) 1956

Viscount 806 (four Dart) 1957

Vanguard (four Tyne) 1959
Super VC10 (four Conway) due 1964

Viscount 810 (four Dart) 1957
VC10 (four Conway) due 1961

1911 1961



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of continuing service.

LUCAS ROTAX

No posed photograph this, but the first interior picture of a Vanguard at work on BEA's routes. As recorded last week, limited fare-paying services began on December 17

AIR COMMERCE

EVIDENCE ON A TAPE

A TRANSCRIPT of the tape-recorded conversation between New York air traffic controllers operators at the time of the DC-8/Super Constellation collision on December 16 was published by the Federal Aviation Agency shortly after the accident. The following are extracts from the 101 pages of the transcript:

LA GUARDIA: I think we got an emergency. Nobody declared anything, but who is that jet or fast-moving aircraft that went from Preston toward Flatbush?

CONTROL CENTRE: From Preston toward Flatbush?

LA GUARDIA: Yes. He's at Flatbush right now.

CONTROL CENTRE: Er, a fast-moving aircraft—going where? Do you know his destination?

LA GUARDIA: I don't know. I think he may have—now listen to this—he may have hit one of our aircraft. We're not sure.

CONTROL CENTRE: All right. Just stand by.

LA GUARDIA: He's now a mile inside Flatbush.

CONTROL CENTRE: All right, stand by one.

LA GUARDIA: New York, New York.

CONTROL CENTRE: Go ahead, La Guardia. What do you have?

LA GUARDIA: All right, now we got troubles, but we're not sure of it. We lost contact with a Constellation, 266 I believe his number is. He was on a collision course with an aircraft, an unknown aircraft, heading north-east from Preston towards Flatbush. That aircraft now is a mile outside the La Guardia outer marker, heading north-east-bound.

CONTROL CENTRE: The unknown, you still have the unknown in radar contact?

LA GUARDIA: No, we're not talking to the unknown, but we see him, yes.

Now La Guardia Approach Control called La Guardia Airport Tower:—

APPROACH CONTROL: I think we have trouble with a Connie, there's something wrong. He's not moving or anything. He might have got hit, uh, by another airplane.

TOWER: Uh, okay.

APPROACH CONTROL: Right, New York, hello, New York.

IDLEWILD: Approach control.

LA GUARDIA APPROACH CONTROL: Uh, is that your traffic at Flatbush?

IDLEWILD: Just a minute. No, it's not our traffic, La Guardia.

LA GUARDIA: Well now, we lost communications with an aircraft, and, ah, something may be wrong with him.

IDLEWILD: Just a minute. It could be ours on approach control, New York.

LA GUARDIA: Yeah, well, what type aircraft is that?

IDLEWILD: A United DC-8.

LA GUARDIA: And what, and what's his altitude?

IDLEWILD: He was last cleared to 5,000.

LA GUARDIA: Oh boy! Our man was at five too. We lost one aircraft. I don't know where he's at now.

A public inquiry was opening in New York last Wednesday. The Airline Pilots Association had unsuccessfully applied for a fortnight's postponement pending further investigations.

HERE WE GO

THERE are no half-measures about British United Airways' £3,100-worth of applications to the Air Transport Licensing Board for new routes. Now that the corporations' monopoly of scheduled services no longer has the force of law, any operator (provided he can afford the extortionate fees) is free to apply to operate any route in his own right. The proposed BUA services are to be operated from London/Gatwick, and the following is an extract from the airline's statement about the applications:—

"The route applications fall into three separate categories:—

(a) Long-haul scheduled services to Lagos, Johannesburg and Khartoum to augment the existing network of *Safari* routes to East, West and Central Africa; initially at weekly frequencies with Britannias, later to be replaced on all the African routes by new long-range jets [see footnote].

(b) A pattern of scheduled services to Paris, Brussels, Amsterdam, Frankfurt, Zurich, Dusseldorf, Cologne, Munich, Turin, Milan, Rome, Genoa, Manchester, Glasgow, Edinburgh, Belfast and Dublin. Frequencies applied for on these routes range from twice-weekly to twice-daily.

(c) Seasonal scheduled services to European and other resorts, designed for holidaymakers: Madeira, Palma, Barcelona, Nice, Lourdes, Naples, Palermo, Basle, Athens, Biarritz, Cairo/Luxor, Venice and Nicosia. Frequencies applied for on these routes range from once-fortnightly to five times weekly.

It is proposed initially to operate all services in the latter two categories with Viscount aircraft, with the option to introduce new jets at a later date."

Interest centres on the fact that every one of the proposed terminals, except Manchester, Glasgow, Edinburgh and Belfast, will involve the negotiation of traffic rights with the countries concerned—because the Civil Aviation Licensing Act [Section 2(3)] says that if the Minister thinks that any application "*would in his opinion involve the negotiation [of traffic rights] which it would be inexpedient for the time being to seek, the Board shall forthwith refuse that application . . .*"

Now clearly apparent is the tremendous power that the Ministry, by virtue of their complete control of traffic-rights matters, will always have over the new Board. Every application will first be scrutinized by the Ministry's traffic-rights experts and, if the Minister is advised that it looks politically tricky, he can direct the Board to reject it forthwith.

Will BUA's applications be thus vetted by the Minister? The Ministry, not surprisingly, are silent on this point. But even if they decide to let these applications—some of which certainly do look politically tricky—go before the Board, British United will still be confronted with the obstruction of Section 2(2)(g). This requires the Board to take into account "any commercial agreement reasonably entered into . . . by the holder of any air service licence already granted." This means that BEA's inevitable opposition to the Europe-area applications will be based on the fact that it is in pool with foreign carriers on all of the routes concerned.

Assuming furthermore that the Minister does not direct the Board to reject BUA's applications on "inexpediency" grounds, and also that the Board decides in its wisdom that pool agreements are not sacrosanct and grants British United licences for at least some of the routes applied for—assuming all these things, the Minister will still have to negotiate the necessary traffic rights. With what degree of enthusiasm he will do this, having in mind his vested interest in the State corporations, remains to be seen.

But assuming that he does bring maximum pressure to bear on the foreign governments concerned, it also remains to be seen whether these governments will regard the idea of multiple designation of British carriers as a threat to their own carriers. They could well demand that, if BUA is to be granted the necessary third and fourth freedoms, then this airline's share of the traffic must be a slice of BEA's share. Which will bring to the fore once again the familiar old bogey-words "material diversion"—words which are embalmed in the new Act [2(2)(f)] as one of the things which must be taken into consideration by the Board in granting licences.

Of course, British United Airways know the difficulties as well as anyone, and perhaps £3,100 is not a lot of money to a big independent—especially if it establishes BUA in the minds of competing independents as Britain's prospective No 2 European operator.

This is a test case, and it will be worth watching closely. Of particular interest perhaps, since few of the above difficulties apply, will be British United's applications to operate domestic services from London to Manchester, Glasgow, Edinburgh and Belfast.

J. M. R.

Footnote: The *Daily Express* last week reported that a contract for four VC10s will be signed "in a few weeks" by British United Airways. A spokesman for the airline was unable to confirm or deny this report.

The first of four Fokker Friendships ordered by New Zealand National Airways Corporation, seen here on a manufacturers' test flight, was delivered on December 12; it arrived in Wellington, say the manufacturers, "exactly on schedule"

AIR COMMERCE . . .

NO RUNWAYS LEFT AT LONDON

"IN view of the fantastic fees already charged at London Airport and the increases proposed, it is appalling that something more effective cannot be provided. We can understand and appreciate the need for repairs but, as an airline operator, we have to consider an efficient service for our passengers. It is most unfortunate that only one runway is normally available." These angry words from TWA were the result of an MoA warning last week that London Airport's only remaining serviceable jet runway, 10L/28R, would be closed for repairs on December 29 between seven and eight o'clock in the morning. In practice no aircraft were delayed or diverted, and the work was completed in time for a PanAm 707 to land at 0745hr.

Recent lifting of tarmac repair patches on No 1 runway has made it necessary to close it on most nights between 2300hr and 0600hr, although last winter this runway was out of commission for six months for resurfacing and the installation of new lighting. The parallel No 5 runway, 28L/10R, was withdrawn from service some months ago for extension and improvements and will not open again until March. Moreover, because runways Nos 6 and 7 cross or overlap it, they are closed as well. No 2 runway (05R/23L), the only present alternative to 10L/28R, was put out of action by the BOAC Boeing 707 which swung off it when landing from Chicago on Christmas Eve, and until the aircraft was moved five days later it restricted the effective length to 6,000ft and its use to much lighter aircraft.

Delay in moving the Boeing, G-APFN, was the result of difficulty in obtaining the necessary equipment over the Christmas holiday; air bags and 2,000 railway sleepers were required to raise the aircraft and work it across muddy ground towards the hangars. The Boeing, which left the runway after touching down, was badly damaged, although none of the 95 passengers or 12 crew was injured. It is reported that one wing was reduced to "a tangled mass of metal," the lower part of the undercarriage fractured and the engines forced upwards.

THE AIRLINES WIN

FACED with the possibility of refusal by the airlines using UK airports to co-operate over the proposed travel cards, the Board of Trade has decided not to proceed with the scheme. It was to have been introduced by an Order, and brought into effect on January 1. Instead, says the Board of Trade in a Press notice, "the Government have decided to collect migration and tourist statistics of British and Commonwealth passengers travelling on the long air routes (beyond Europe) by means of a voluntary sample."

It remains to be seen whether distribution and collection of sampling cards will be done by the Board of Trade.

LORD BRABAZON *v* SIR WILLIAM

REACTION by IATA to Lord Brabazon's "fuel duel" challenge, expressed in a letter to him from Sir William Hildred, the Association's director-general, reflects airline irritation with what they feel is the over-simplification of technical argument aired in public. When Lord Brabazon first raised the issue of JP.4 *versus* kerosine, he said that he hoped that his words would "echo round the world." But it was his fuel-ignition demonstration on the BBC television programme "Panorama" which has aroused the strongest reactions. Secure in the knowledge that his case is a strong one, Lord Brabazon offered *The Listener* the letters exchanged between him and Sir William. They are reproduced here in full:—

December 2, 1960

My dear Brab:

When some months ago you expressed views about JP.4 at an ARB lunch, I wrote to you limiting myself to a correction of the accident figures wrongly ascribed to you in the Press reports.

I now learn from *Flight* and other sources that the subject has been raised again, this time on television before 8,000,000 viewers. The incident has been, I find, brought up at a meeting of IATA's technical committee which is at present meeting in Rio and I have just received the following cable from the chairman:

> "I wish to inform you that as result of discussion at technical committee meeting in Rio it is their unanimous opinion that recent public statements and television demonstration in the UK on JP.4 versus kerosine are harmful to the worldwide airline industry and might indirectly be handicap to the British aviation manufacturers. The Committee feels most strongly that generalized public statements on such complicated technical matters by persons holding responsible positions in aviation and particularly airworthiness authorities are wrong in principle and can only be harmful to the formulation of sound technical decisions based on factual evidence.—Chairman IATA technical committee."

This Committee contains a score of the best technical operators in the international industry. The annual conference which they control brings together over 500 of the best minds from research establishments, government departments, fuel specialists, engine, airframe and accessory manufacturers, and fighting services. They are doing a serious and valuable job. I have no difficulty in placing before you their opinion, with which I agree.

I am very good at minding my own business, but supposing you were absolutely right in your views, is it good to ventilate those views before 8,000,000 "sweaty nightcaps." What does it avail you? With your enormous prestige is it not better to hammer those views out with technical people rather than to make dangerous statements to the emotional millions?

And if you were wrong in your views, then have you not done a real disservice to the cause of aviation in general and perhaps to British aviation in particular? I am puzzled and disturbed to find that you have chosen such a form.

Yours sincerely,
WILLIAM P. HILDRED,
Director-General

December 12, 1960

My dear Hildred,

Always pleasant to have a letter from you, but the one I am about to answer is signed by you as Director-General of IATA and it is to that individual I must address these somewhat harsh words.

Let us be perfectly clear about the subject. No one has disputed, least of all myself, that turbine engines can run satisfactorily and safely on kerosine or JP.4, otherwise the ARB would not have certified them.

The point is that speeds of take-off and landing have gone up and in the event of a minor crash fuel will be spilt.

What I have done is to show the somewhat axiomatic fact graphically that whereas kerosine takes time to ignite, JP.4 flashes into a bonfire. No conference of so-called experts gathered at Rio or anywhere else can dispute this. I cannot follow why the truth about the behaviour of the two fuels under the circumstances named should not be known and is it not an example of contempt for your passengers, upon whom you exist, and your desire to keep them in ignorance of something that affects them, that you should dub those that saw the BBC television programme as "8,000,000 sweaty nightcaps"?

The crux of the question was given away by Mr Knut Hagrup at Copenhagen when he said "The point is that if JP.4 tends to become cheaper (it isn't now, but it may become cheaper) then we must be ready for it."

Strange that there was no desire to use JP.4 when it was dearer. The same so-called experts existed before, but their super knowledge was never voiced!

It is patently clear that the desire to use JP.4 is based on money making. I freely admit it has always been a question as to how much you should pay for safety. In this case on the basis that truth and knowledge should be known, it may be passengers might be prepared to pay a surcharge for travelling by kerosine, but I cannot and will not subscribe to your views that everyone except those interested in running airlines should be kept in ignorance of basic facts.

A word about the rather comic telegram from Rio. First of all, if the technical committee are unconvinced as to what happens to the respective fuels in the case of a minor crash I am quite prepared to repeat the experiment, but a study of the La Guardia accident to an Electra when seventy people walked out of an aeroplane using kerosine that crashed and caught fire, instead of being burned alive, will appeal to passengers, if not apparently to some operators.

Second of all I do not follow the rather sinister veiled threat to British aviation. Turbine engines are turbine engines wherever they are made, and most reputable operators all over the world use kerosine.

The question your "best minds" have to answer is, in what way has JP.4 suddenly become so safe, now it is cheaper than kerosine?

I will not disclose to you my real opinion of IATA, but you must bear in mind that it is an organization of operators and for that very reason the decisions they take are for their own advantage. There are other points of view and the time has come when they will be aired even if it is disagreeable to the Association.

It is indeed a strange situation I find myself in to be accused of doing harm to aviation by endeavouring to make it safer.

As it was the BBC who inspired the demonstration I am sending this correspondence to them, as it will interest them.

Yours sincerely,
BRABAZON OF TARA

First flight of the 25/28-seat S-61L twin-turbine helicopter was made on December 15 from Sikorsky's factory at Stratford, Connecticut. Los Angeles Airways have ordered five and Chicago Helicopter Airways four. Cruising speed is said to be 135 m.p.h.

The exchange did not end there; a few days afterwards Sir William decided to commit *his* views to print. The following statement was issued by IATA:—

"In view of Press statements attributed to Lord Brabazon, it should be pointed out that JP.4 turbine fuel is neither new nor highly explosive.

"JP.4 has been extensively proved by years of use in both civil and military aircraft. It is accommodated in specifications of engine manufacturers. Its use has been sanctioned after full consideration by the safety authorities of governments, including the Air Registration Board of the United Kingdom, of which Lord Brabazon is chairman.

"JP.4 is less volatile and less explosive than fuels which for years have been used in piston-engined aircraft—and for that matter is less volatile than the gasoline which an automobile owner puts into his own tank.

"The choice of a fuel is a matter for highly involved technical analysis by an individual airline. The characteristics of JP.4 and kerosine vary widely, often depending on the source of the basic petroleum from which both derive. Under a given set of conditions, JP.4 may be more susceptible to ignition; while under other conditions the reverse may be true. An airline selects one fuel or the other—and in some cases elects to use both—on the basis of its own assessment of the frequency with which it will meet these various conditions in its own pattern of operations. Price does not become a factor until an airline is fully satisfied on the point of safety. Indeed, the relative prices of JP.4 and kerosine vary in themselves: for example, kerosine, which is not taxed as aviation fuel, is cheaper in the United Kingdom.

"The techniques and equipment for handling JP.4 and kerosine on the ground and in the air have been perfected after many years of experience with gasoline. Whichever fuel is used, an airline's basic interest is in the safety of its passengers and aircraft. Neither is expendable."

Lord Brabazon countered:—

"Sir William gives us a lot of facts that are well known and with which I do not actively quarrel, but he is so near the trees that he doesn't see the wood. We have always been aware that [petrol] was of all fuels the most dangerous to carry but we had to put up with it and machines carrying it were, and are today, deemed airworthy if not entirely crashworthy. The turbine-engined aeroplane stands in the same position as the piston engine, but the point is, it can and does operate as successfully on kerosine.

"Whether using JP.4 fuel more than necessary would, in the event of a minor crash, be considered as negligence would be for a court to decide, but I cannot help reminding operators that . . . claims would be unlimited and a charge of manslaughter would have to be faced.

"Sir William accuses me of frightening the travelling public. I sincerely hope I have frightened operators into coming to earth safely."

Last words from the chairman of BOAC, Sir Matthew Slattery, whose airline now uses only kerosine:—

"I do not feel justified in condemning those who use JP.4, but on balance I have made up my mind that kerosine is safer."

MORE THAN 100 MILLION PASSENGERS

FOR the first time, more than 100m passengers (actually 108m) were flown last year by the 83 member nations of ICAO. This is estimated by the Organization in an end-of-the-year statement in which provisional figures also show that the total number of passenger-miles increased by 14 per cent, the same rate of increase as in 1959 and in 1957.

In the year 1958, largely due to the American trade recession and the fall in US domestic traffic, the increase was only 5 per cent. Cargo ton miles increased by 14 per cent also, and mail ton miles went up 15 per cent. Thus, the year 1960—in terms of total load ton miles carried on scheduled services—was close to the 15 per cent annual rate of increase popular with most traffic forecasters and market survey experts.

A TURBOPROP IS NOT A JET

AS from this week, American airline advertisements may use the word "jet" only with reference to pure-jet aircraft such as the Boeing 707, DC-8 and Convair 880/990. Turboprop airliners such as the F-27, Viscount and Electra must be referred to as "jet-prop," "turboprop" or 'prop-jet." Advertisements showing a propeller aircraft must show propellers or propeller traces.

The new rules were adopted by the US Air Transport Association's air traffic conference. Other provisions made included: (1) No airline shall advertise a flight time less than the time shown in its timetable; (2) No member shall advertise a fare lower than that shown in its tariff, and no member shall advertise "the lowest fare" unless its tariff shows a fare lower than that of any other member airline; (3) No member shall advertise "the fastest service" unless its timetables reflect less time than shown in the schedules of other airlines; (4) Advertisements of new services must give the starting date or use a phrase such as "coming soon."

"BEA WANT THE HERALD"

DELIVERY of Heralds to BEA, who are to operate three purchased by the Government, "has been held up by the Ministry of Aviation." This was said by Lord Douglas at the recent annual dinner of Handley Page senior staff. "The sooner we get them the better," he added. These words are attributed to Lord Douglas in a Handley Page news release entitled "BEA very keen to have Heralds, says Lord Douglas."

It will be recalled that in June 1959 the Government, through the then Minister of Supply, Mr Aubrey Jones, told the House

Taken by a Vickers photographer when TCA's first Vanguard arrived in Canada are these photographs of Montreal's $30m new airport at Dorval, opened last month. On the left is the administrative centre and the picture on the right shows the interior of one of the two very long fingers. Design of the terminal building does not meet with universal approval, as a letter on page 37 suggests

AIR COMMERCE . . .

of Commons that negotiations were to be opened with Handley Page, and also with Avro, with a view to purchasing three Heralds and three 748s at a cost of about £750,000 per contract. He said that the commercial prospects of these aircraft would be improved by "an early demonstration of their efficiency in regular operation on normal services in the UK."

According to the original plan, the Heralds were to be operated by BEA on Scottish routes for a period of five years, at the end of which they would be bought from the Government if they proved satisfactory. Eighteen months have now gone by, and still the contract between Handley Page and the Ministry of Aviation has not been signed. Meanwhile BEA's three Heralds (Series 100) are in production, and the first—according to a Handley Page spokesman at the SBAC Display last September—will be delivered to BEA towards the end of this month, January 1961, and the following two in February.

Asked to comment on Lord Douglas's statement, a Ministry spokesman was "not prepared to say more than that negotiations are continuing." He could give no reasons for the delay.

The most likely explanation is that the Minister of Aviation, Mr Peter Thorneycroft, has been unwilling to sanction public expenditure on an aircraft which, should Handley Page ever join Hawker Siddeley might, in his view, be bought off in favour of the Avro 748 (though never announced, Hawker Siddeley decided nearly a year ago not to proceed with the proposed Ministry 748 order, possibly because of royalty strings. It is believed that an order for 748s for the RAF is in any case now in the offing). Thus if BEA are to operate Heralds a way must be found to break the deadlock between the Ministry of Aviation and Handley Page.

Speaking on the same occasion as Lord Douglas, Sir Frederick Handley Page said of reports that an American firm [McDonnell] were making a take-over bid for his company: "As for the rumour of American control, this is comparable to the National Gallery or the British Museum passing to foreign interests. Indeed, no foreign company has enough money to buy Handley Page talents." Negotiations with the Americans, he said, "concern our efforts to sell Heralds in the United States. We hope that McDonnell, for example, will sell Heralds in US markets. Reciprocally we could build and sell some of their aircraft."

EMPTY COCKPITS AT HAMBLE

THIS week Sir Matthew Slattery and Lord Douglas of Kirtleside, chairmen of the British airline corporations, were visiting the college of air training at Hamble. Afterwards they were to be asked to review the reasons why recruitment of budding airline pilots has fallen short of the numbers required.

The shortage of candidates for jobs where *starting* salaries are £1,000 a year and where annual rewards may eventually top £5,000 seems surprising, since the personal cost of this expensive training compares favourably with that of a university education. Personal outlay is about £700 for a training that, according to the principal of the college, AVM E. C. Bates, is worth about £8,000, and may be much less if a local-authority grant is received.

Nevertheless, competition from the universities and from industry, reluctance of parents and headmasters to see boys embarking on a career involving even a degree of personal hazard, and a shortage of sufficient boys with adequate qualifications, has limited the number of applications for training which the corporations receive. When the college opened, BOAC had managed to select for 50 vacancies only 41 boys. For this number 260 applicants were called for interview from some 1,500 enquiries that BEA and BOAC had received.

Although the two corporations may be disappointed so quickly to have encountered a recruiting problem, the difficulty was not entirely unexpected, competition from the Services, from universities and from the industry being of concern to Mr G. V. Hole (Under-Secretary to the Ministry of Aviation and a member of the college board) at the time when formation of a national college was announced in November 1959. To allow a final selection of about 100 students a year to be made the college needs at least 600 annual applications from boys aged between 18 and 20 (or up to 24 in the case of university graduates). BEA alone estimate that they will need 100 new pilots by the autumn of 1962.

Bringing additional technical strength to air transport managers and consultants Curtis Greensted Associates Ltd, which he is joining, is Mr T. H. Farnsworth, recently chief of flight operations, BOAC

Quebecair's Canadair 540 has been in operation on the 1,600 miles-a-day route Montreal - Quebec - Rimouski - Seven Islands - Wabush and Knob Lake since August at a daily utilization of 6¼hr. The round trip has not been completed on only two occasions and load factor achieved has been between 80 and 85 per cent on all segments of the route, average stage-length on which is about 200 miles

NOT THE SAME AIR UNION

THE early optimistic predictions for Air Union are not now likely to materialize. The thoughts of the four member nations (France, West Germany, Italy and Belgium) are now turning to "a much more cautious approach." This is said by the retiring chairman of Lufthansa, Dr Kurt Weigelt, as reported by *Interavia*. A revealing passage is to the effect that the member airlines are to form subsidiary companies to meet the Air Union requirements—a concept very different from that of one integrated airline, which was the original dream three years ago

Problems cited by Dr Weigelt are:

(1) The political situation in Africa, where the French and Belgian carriers have interests, has complicated the negotiations.

(2) The system of financial accounting to be adopted has proved difficult to solve, an equitable balance of performance, equipment, depreciation and so forth having been difficult to find.

(3) The proposed quotas, i.e. slices of the Air Union cake, have been changed.

Another difficulty may well have been the diversity of equipment bought by the member airlines, which will have made it difficult to achieve a co-ordinated equipment policy along the lines of the SAS/Swissair consortium.

THE UK SAFETY RECORD

IF it is agreed that air safety is a subject about which as much information as possible should be promptly disseminated, then the annual accident survey published by the Ministry of Aviation must be regarded as disappointing. The latest edition, relating to the year 1958, has recently been published*. This is the Ministry's tenth annual survey of accidents to aircraft on the British Register.

So far as accidents to aircraft engaged in air transport are concerned, the document lists thirteen accidents of which six were fatal but of which only one (to the BEA Viscount which collided with an Italian Air Force Sabre over Italy in October, 1958) occurred to a scheduled service.

In terms of fatalities per 100 million passenger-miles (the commonly accepted index for air transport's accident rate) the UK figure in the year 1958 works out exactly to the generally "acceptable" figure of 1.0.

Looking at the safety record of UK scheduled operators during the five years up to 1958, the survey shows that the rate fell from 2.6 in the five years ending 1957 to 2.0. This figure compares with the international (ICAO) scheduled-service fatality rate over the same period of less than 1.2.

It is perhaps unkind to point out that these figures could have been worked out nearly two years ago, when MoA air traffic figures for the year 1958 were published; but it is not easy to understand why compilation of this document should have taken almost two years to complete. Certainly it could be improved by being more promptly circulated, if the names of operators were included, and also if more information could be given about the circumstances and causes of accidents and (entirely absent from the Ministry's survey) recommendations for their future avoidance.

The survey's record of accidents to aircraft not engaged on public transport shows that there were 119, 19 of them fatal—more than in any other post-war year. Of these no fewer than 92

**A Survey of the Accidents to Aircraft of the United Kingdom in the year ended December 31, 1958. HMSO, price 2s 6d.*

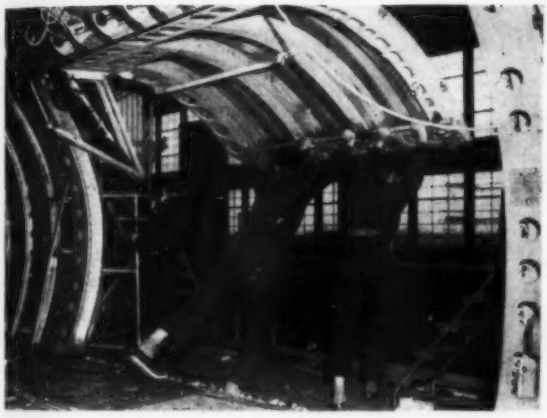
were attributed to pilot error, five to errors of other personnel, and 15 only to material failure.

Perhaps what is most needed—and this may be worth consideration by the Air Safety Board—is the *regular* publication of lessons learned from aircraft accidents. There comes to mind the excellent work done in this respect by the US Flight Safety Foundation, whose motto is "Share Your Experience."

THREE MEN IN AN ARGOSY

THOUGH the FAA has refused Riddle Airlines' request for a concession to permit the operation of Argosies on MATS Logair work with a two-man crew, Riddle are appealing to the Administrator, Mr E. R. Quesada. The airline evidently failed to convince the FAA that the 88,000lb Argosy should be exempt from the 80,000lb gross weight limit which requiries, under US law, a flight engineer.

Riddle based their request on the fact that the Argosy is no more complex than the Viscount, which with the same power plant is cleared by the FAA for two-crew operation. But for the moment the Argosy cannot be legally operated in the US without a flight engineer. Hopes that a concession will be made in this case still appear to be high, and upon their realization may well depend future Argosy sales to operating-cost-conscious US freight operators.



Sabena is the first airline to carry out the conversion of a DC-7C for all-cargo operation, previous modifications to 7F standard having been undertaken by Douglas or by Lockheed Aircraft Services. The conversion took two-and-a-half months and 35,000 man-hours

AUSTRALIA AND THE 727

THE basic attitude of Australian domestic operators to jet airliners, a correspondent writes, is not changed by the Boeing 727 orders. TAA has always taken for granted the decision to produce the 727, as they believed this aircraft would be built once it was clear that Boeing was not interested in the D.H.121 and that Douglas would not produce the DC-9. TAA and Ansett-ANA will in 1961 evaluate and decide between the 727, the Trident and Caravelle 7, 8 and 14.

There is a belief in the Commonwealth that the recent statement by Mr Pearson in the *Financial Times* asking for Government support—which came as a shock to Australians—hinted that the RB.141 is not now to be put into production. Anyway, that conclusion was drawn from lack of mention of the engine in the *Financial Times* statement. If this is correct, then the Caravelle 7 and not the 8 would be evaluated by our domestic operators.

Australian reaction is that it must now be most difficult for BAC to decide to produce the VC11. The BAC offer (*Flight*, October 28, 1960) of a package VC11/BAC-107 deal to Australian domestic operators, still fascinates Ansett-ANA. TAA also are interested.

By 1965-6 Australian domestic business may demand an aircraft with 90 seats, where 70 is the mean now. The 727 has a greater productivity than the Trident or Caravelle, Australian operators consider, but both feel that if the VC11 is built it could have the edge. The whole 727 appeal is not only economic, for the Boeing's short-take-off capability also has great attractions here. It is understood tyre pressures are quite low, too.

Capt P. A. Travers has been appointed commercial manager of East African Airways' new commercial department, formed on January 1

For Qantas' lesser routes, such as those to South Africa and Hong Kong, which will not see 707s (though the 707 will go on the Tokyo run), the 727 might appeal as an Electra-Constellation replacement. Qantas intend keeping the Electra on the Sydney - New Guinea - Hong Kong run indefinitely and will introduce it on the South Africa route if SAA agree. At some stage there must be a jet replacement. Qantas have been so pleased with the 707 that the 727 decision must influence their thinking at some stage, although it is too early to do so yet.

BREVITIES

On December 30 the CAB examiner approved the proposed merger between United and Capital.

Lord Douglas, chairman of BEA, has been granted a salary increase of £1,000 a year. His present salary is £7,500, plus £1,000 expenses.

The instalments on MEA's order for four Comet 4Cs is underwritten by BOAC and not, as inadvertently stated in last week's issue, by BEA.

Air France Boeing 707 pilots and crews ended their 19-day strike on December 27 following government intervention.

Maiden flight of the Douglas DC-8-50 (P & W JT3D turbofans) took place on December 20 at Long Beach. The type has been ordered by KLM, Iberia, Aeronaves and United.

Philippine Air Lines have ordered a third Fokker Friendship. The contract, signed in Manila on December 19, brings to 86 the total number of Fokker-built aircraft on order, and 169 including Fairchild.

Today, January 6, is to be the occasion of a formal ceremony at Liverpool Airport marking the transfer of control (as from January 1) from the Ministry of Aviation to the City Council.

Newcastle Corporation has applied to the Minister of Aviation for a Government grant towards the cost of a new terminal building. Mr Peter Thorneycroft recently received a delegation of MPs and representatives of local authorities.

Yesterday, January 5, Plymouth ratepayers went to the polls to vote for or against the City Council's decision to promote a Bill empowering it to acquire land on which to build a new airport at Harrowbeer, nine miles from the city.

Mr M. A. Snowball, BOAC's assistant general manager for South America, has been appointed manager responsible for the whole of the corporation's South American effort. Mr G. W. W. Dodd becomes responsible for BOAC sales in the area.

The Caravelle order-book has now passed the 100 mark, actually standing at 102. The most recent contract was a repeat-order placed by Finnair for one Caravelle, to bring their fleet up to four. Previously Air France placed a repeat-order for six, bringing their fleet up to 35. More than 50 Caravelles have now flown nearly 100,000hr.

According to *Aviation Week*, the six Il-18s bought by Ghana Airways were offered at a price of £670,000 each, the order—according to other reports—providing for the free delivery of four spare engines per aircraft. Payment is believed to be spread over eight years at 2.5 per cent, with a 10 per cent down payment.

Opened at Montreal on December 15 by Canada's Minister of Transport, the Hon Leon Balcer, was TCA's new $20m maintenance base for the overhaul of Vanguards, DC-8s, Conways and Tynes. A training base is adjacent

SERVICE AVIATION

Air Force, Naval and Army Flying News

RAF New Year Honours

THERE are 180 names of RAF, WRAF, RAuxAF, RAFVR and Princess Mary's RAF Nursing Service personnel in the 1961 list of New Year honours and awards, headed by that of the CAS, Air Chief Marshal Sir Thomas Pike, who becomes a GCB. Amongst those who have been honoured are Wg Cdr Charles Maughan (AFC), who won the London-Paris race in 1959, and Sqn Ldr Garstin (also AFC), who in March last year captained a Valiant which flew the greatest distance ever achieved by an RAF aircraft—8,500 miles. The full list is as follows:—

Honours

ORDER OF THE BATH

Knight Grand Cross: Air Chief Marshal Sir Thomas Geoffrey Pike, KCB, CBE, DFC.

Knights Commanders: Air Marshal S. C. Elworthy, CB, CBE, DSO, MVO, DFC, AFC, MA; Acting Air Marshal A. D. Selway, CB, DFC.

Companions: AVM M. H. Dwyer, CBE; AVM G. A. M. Knight, CBE, QHS, MB, BS, DLO; Acting AVM E. L. Colbeck-Welch, OBE, DFC; Air Cdre F. E. Rosier, CBE, DSO; Air Cdre R. G. Seymour, CBE; Air Cdre D. F. Spotswood, CBE, DSO, DFC, ADC; Acting Air Cdre A. Pyke, OBE, MIMechE, AFRAeS.

ORDER OF THE BRITISH EMPIRE

Knight Grand Cross: Air Chief Marshal the Right Hon the Earl of Bandon, KBE, CB, CVO, DSO.

Knights Commanders: Air Marshal A. Earle, CB, CBE; Air Marshal H. P. Fraser, CB, CBE, AFC, BA, FRAeS.

Commanders: Acting Air Cdre F. Hume; Acting Air Cdre C. H. Simpson, MA; Gp Capt C. C. Barker, AFC, MB, ChB; Gp Capt A. W. Caswell, OBE, AFRAeS; Gp Capt W. D. David, DFC, AFC; Gp Capt E. W. T. Hardie; Gp Capt W. D. Hodgkinson, DFC, AFC, ADC; Gp Capt E. N. Ryder, DFC, RAF (Ret); Gp Capt C. L. Troop, RAF (Ret); Gp Capt F. A. Willan, DFC, MA.

Officers: Wg Cdr the Hon M. C. Adderley, AFC; Wg Cdr G. Buckle; Wg Cdr A. S. Cade; Wg Cdr E. A. Challis; Wg Cdr J. Dalgleish; Wg Cdr R. U. P. De Burgh; Wg Cdr R. Findlater, DSO, DFC; Wg Cdr G. A. Fricker, RAF (Ret); Wg Cdr L. G. Holmes, DFC, AFC; Wg Cdr W. T. H. Howell, DFC; Wg Cdr D. E. Longley; Wg Cdr W. S. O. Randle, MBE, AFC, DFM; Wg Cdr G. H. Tebboth; Wg Cdr I. Thomas, DFC; Wg Cdr P. D. Thorne, AFC; Acting Wg Cdr A. V. Duffill, DFC, RAuxAF; Acting Wg Cdr S. A. Hinde, RAFVR (Training Branch); Sqn Ldr K. Courtnage, AFC.

Members: Sqn Ldr S. D. Baldock, DFM; Sqn Ldr R. S. Brown; Sqn Ldr C. F. S. Churcher; Sqn Ldr S. G. A. Goddard; Sqn Ldr H. E. Jacobs; Sqn Ldr W. C. James, BA; Sqn Ldr G. H. Louden; Sqn Off J. Mackay, WRAF; Sqn Ldr K. Macrae; Sqn Ldr (Acting Wg Cdr) E. J. D. Masters; Sqn Ldr D. Phillips, DFC; Sqn Off (Acting Wg Off) G. M. Phillips, WRAF; Sqn Ldr R. Renner; Sqn Ldr (now Wg Cdr) W. A. Russell, BSC; Sqn Ldr F. R. C. Staff; Sqn Ldr (Acting Wg Cdr) J. C. K. Sutton, AFRAeS; Sqn Ldr J. Wilson; Acting Sqn Ldr S. R. Jeffrey, DFC; Acting Sqn Ldr J. F. Leckie; Acting Sqn Ldr F. G. Ley, RAFVR (Training Branch); Flt Lt A. J. Aedy; Flt Lt J. D. Davie; Flt Lt J. E. Greenaway; Flt Lt H. Logan; Flt Lt J. R. Morris; Flt Lt H. A. Pollock; Flt Lt H. M. Sorrell; Flt Lt E. W. Tipple; Flt Lt H. B. Todd; Flt Lt G. W. J. Walker; Flt Lt A. G. Willshaw, BEM; Flt Lt L. Wing; Acting Flt Lt H. P. Davies, RAFVR (Training Branch); Fg Off J. M. F. Crofts, RAuxAF; Fg Off G. A. Tottey; M/Eng W. J. H. Wickson; M/Tech L. M. Howe; M/Tech W. F. Jackman; WO T. A. Armstrong; WO J. Binns; WO H. C. Furse; WO S. Banyard Hicks, BEM; WO A. T. Jarvis; WO P. Portway; WO J. A. Rollason.

Awards

Bar to Air Force Cross: Sqn Ldr H. A. Merriman, AFC.

Air Force Cross: Wg Cdr R. W. Jordan, DFC; Wg Cdr C. G. Maughan; Sqn Ldr J. M. Crowley; Sqn Ldr J. H. Garstin; Sqn Ldr A. D. A. Honley; Sqn Ldr J. A. McArthur; Sqn Ldr J. Primrose; Sqn Ldr R. T. Robinson; Sqn Ldr H. Smith, DFC; Sqn Ldr P. A. Thomson; Flt Lt J. G. Cruse; Flt Lt R. G. Hanna; Flt Lt A. D. Harvie; Flt Lt G. N. Lewis; Flt Lt M. N. Sparks.

Royal Red Cross (First Class): Wg Off G. Jones, ARRC, Princess Mary's RAF Nursing Service.

Royal Red Cross (Second Class): Sqn Off C. Whyte, Princess Mary's RAF Nursing Service.

Air Force Medal: F/Sgt (now M/Eng) M. Brennan, DFM; Sgt D. J. Greenwood.

British Empire Medal (Military): F/Sgt G. F. Anstey; F/Sgt G. Bumford; F/Sgt (now WO) F. G. Burnett; F/Sgt K. M. Busby; F/Sgt F. J. Cann; F/Sgt D. Duffill, RAF Regt; F/Sgt W. J. J. Hambly; F/Sgt J. W. Legge; F/Sgt P. Marshall; F/Sgt T. D. Oakes; F/Sgt F. H. Rose; F/Sgt P. A. Searle; F/Sgt J. E. Smith; F/Sgt W. Thompson; Ch Tech J. Atkinson; Ch Tech J. E. Dyson; Ch Tech L. R. Farley; Ch Tech K. T. Fulford; Ch Tech G. Lawrence; Ch Tech D. M. J. Mackie; Ch Tech E. H. Ramshaw; Ch Tech (now M/Tech) J. Smith; Ch Tech W. J. Smithers; Ch Tech A. J. Tick; Acting F/Sgt D. G. Clark, RAuxAF; Sgt M. B. D. Barraclough, RAF Regt; Sgt R. A. Barrett; Sgt R. Hardy; Sgt J. R. Hillary; Sgt H. R. Howard; Sgt W. T. Howard; Sgt A. J. Keech; Sgt T. L. Latham; Sgt L. A. Lawrence; Sgt D. Maisey, RAF Regt; Sgt D. G. Tilford; Sgt J. E. Varey; Sgt R. B. Walsh; Sgt C. E. Wilks; Snr Tech J. M. Brewster; Snr Tech R. G. Holdaway; Cpl P. W. M. Coomber; Cpl J. M. Orr.

Queen's Commendations for Valuable Service in the Air: Wg Cdr D. Le Roy Bird, AFRAeS; Wg Cdr R. A. N. McCready, OBE; Sqn Ldr J. A. H. Armstrong, MBE; Sqn Ldr D. M. Fleming, DFC; Sqn Ldr D. E. King, DFC; Sqn Ldr R. Neil; Sqn Ldr J. S. Owen, AFC; Sqn Ldr E. S. Rooney; Flt Lt A. N. Ansell; Flt Lt J. Birnie; Flt Lt J. M. Bott; Flt Lt D. S. Bridson; Flt Lt R. C. Chapman, DFC; Flt Lt N. Clayton; Flt Lt G. Cristinacce; Flt Lt R. B. Morgan, DFC; Flt Lt F. C. B. Penny, AFM; Flt Lt R. Rimington; Flt Lt H. Rumble, DFC; Flt Lt B. A. Sedgley; Flt Lt T. S. Syme, DFC; Flt Lt P. Thompson; Flt Lt K. M. Williamson; Fg Off P. A. W. Forrester; Fg Off M. C. Godfrey; Fg Off H. Marshall; M/Plt J. J. Campbell; M/Sig I. C. Webb, BEM; F/Sgt W. N. F. Wollan.

Recommended by the Secretary of State for Commonwealth Relations:—

MBE: Sqn Ldr R. C. Hogg; *AFC:* Flt Lt R. Griffin.

Air Cdre C. B. E. Burt-Andrews (right), Commandant of the Pakistan Air Force College, being greeted by Air Cdre G. C. Hartnell, who commands RAAF Butterworth in Malaya, when six of the directing staff and four students of the college recently visited the RAAF base

FAA Honours and Awards

MEMBERS of the Fleet Air Arm included in the Royal Navy list of New Year honours and awards are as follows:—

Honours

ORDER OF THE BATH

Knight Commander: Vice-Admiral L. G. Durlacher, CB, OBE, DSC.

Companion: Rear Admiral R. M. Smeeton, MBE.

ORDER OF THE BRITISH EMPIRE

Officer: Surg Lt Cdr J. S. P. Rawlins, MBE, MA, BM, BCh.

Members: Lt Cdr J. G. Corbett; Lt Cdr A. T. J. Diboll; Lt Cdr (SD) D. W. F. Elliott; Lt Cdr L. R. Tivy; Temp Lt Cdr (A) (AE) N. G. Parkinson, RNVR.

Awards

British Empire Medal (Military): Ac Mech (AE) 1st Class A. W. H. Heald; CPO (Acwman 1st Class) N. Jarvis; Ac Art 1st Class A. P. J. Stebbing; Rad Elec Art (Air) 1st Class H. J. Williams.

RAF Half-yearly Promotions

THREE new air marshals, all in the GD Branch, head the January 1 list of RAF half-yearly promotions: they are AVMs A. D. Selway, Sir Wallace Kyle and R. B. Lees. There are six promotions to air vice-marshal: Air Cdres G. C. Everleigh, J. R. Gordon-Finlayson, W. E. Coles and E. L. Colbeck-Welch in the GD Branch; Air Cdre M. E. M. Perkins in the Technical Branch; and Air Cdre E. Knowles in the Education Branch.

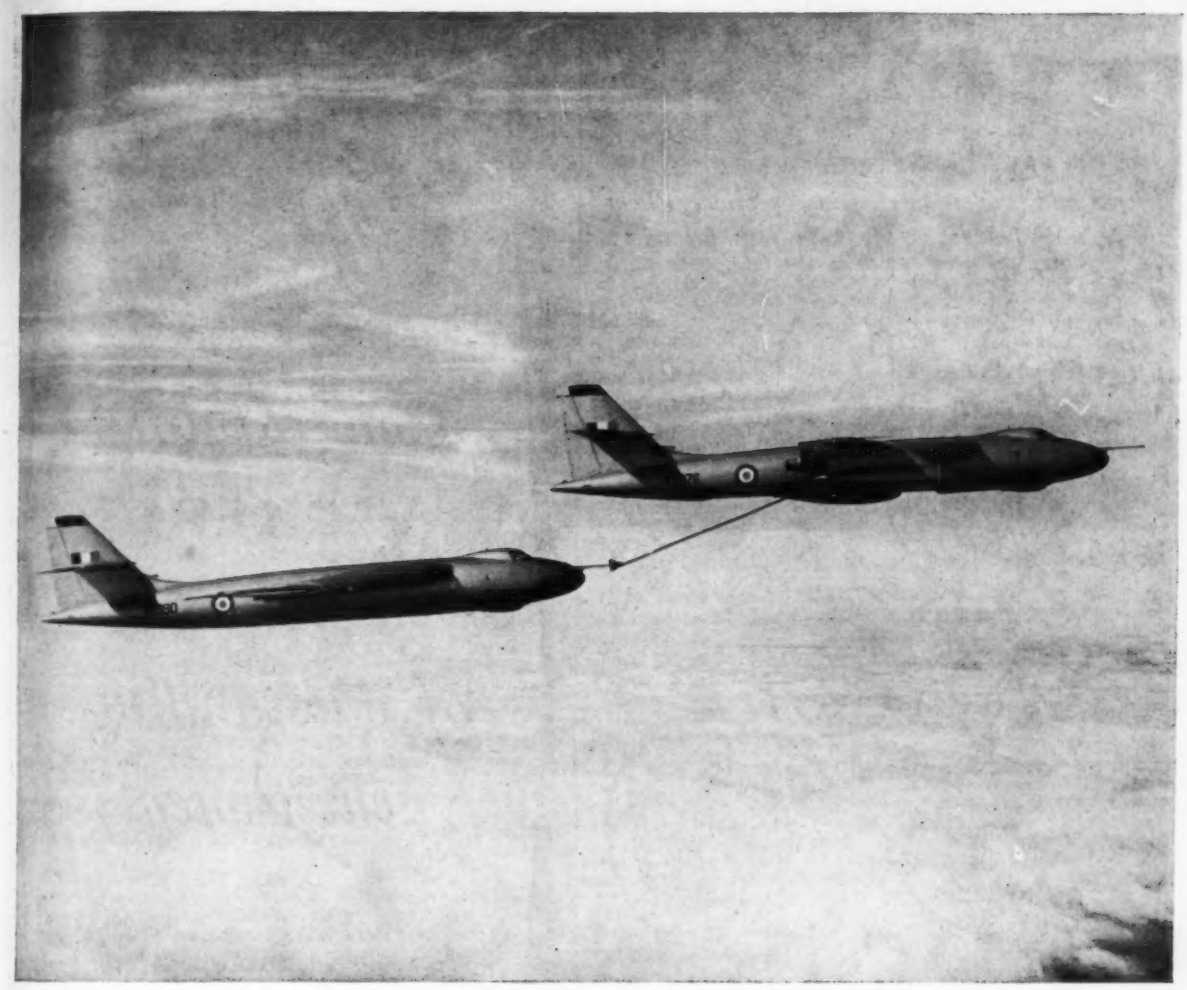
IN BRIEF

There is to be a No 4 Sqn reunion at the RAF Club, 128 Piccadilly, London W1, on Saturday, February 18. Details are available from Flt Lt A. A. Boyle, Officers' Mess, RAF Leuchars, Fife, Scotland.

No 8 Sqn is "sadly deficient in records of its history," and Fg Off J. Volkers has written to say that the squadron would be very grateful to past members and friends for any documents and information that they could supply to remedy this situation. His address is No 8 Squadron, RAF Khormaksar, BFPO 69.

Flt Lt D. A. Stevenson of No 28 (FR) Sqn about to take off on a sortie in his Venom from RAF Kai Tak, Hong Kong, where the squadron has been based since it moved from Sek Kong in 1957. Assisting him with cockpit checks is SAC D. P. Minogue

We are proud of our connections



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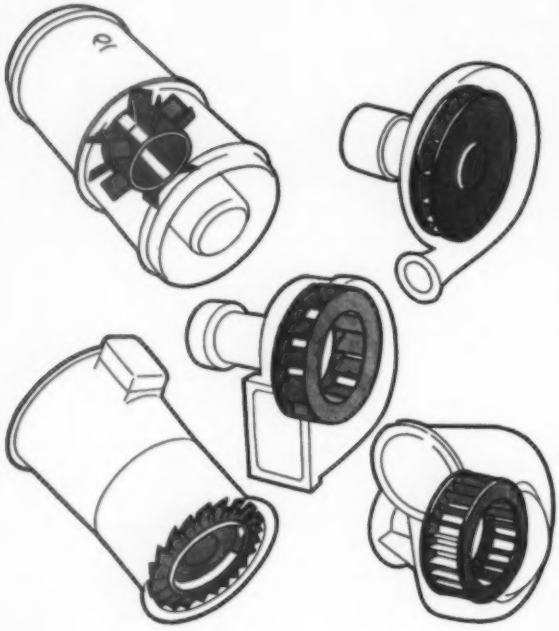

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Correspondence

The Editor of "Flight" is not necessarily in agreement with the views expressed by correspondents in these columns. Names and addresses of writers, not for publication in detail, must in all cases accompany letters.

Executive Comfort

NOT so many years ago flying by the seat of the pants was a general, if mildly uncouth, way of aviating. But as "Executive Pilot" remarks in your December 23 issue, there is no need for that sort of thing in the air today.

We are being as couth as we can in planning the BEAGLE range of executive and light aircraft. People's basic feelings are being carefully considered in the design of seating: at bottom there can be no excuse for numbness in this matter.

We are also making sure that pilots and passengers will be able to see—as well as be—out and about more than before. We hope that they will at the same time be able to keep their feet as warm, or their heads as cool, as they may desire.

Ladies are, of course, always in the forefront of design-thinking. We believe that Beagling is now becoming a popular feminine, as well as male, pursuit. Irrespective of the way she may be dressed, we trust that no lady will be in the least embarrassed by a BEAGLE.

London W1 PETER G. MASEFIELD,
Managing Director, British Executive & General Aviation Ltd

Fuel Duel

BY regretting that fuel technologists have not "answered" Lord Brabazon's claims [about the superior safety of kerosine in certain types of accident] made during a recent BBC *Panorama* programme, Mr Colbourne [December 9] seems to imply that these claims are invalid. Will it make your correspondent feel any better if I point out that there was a fuel technologist present at the demonstration? I shall be glad to effect an introduction if so desired.

Mr Colbourne should also know that other fuel technologists, and very eminent ones such as A. R. Ogston of Esso Export and E. L. Bass of Shell, have over the years made claims identical to those of Lord Brabazon.

I, too, am unhappy that we should have used television to remind the public of the fire hazard associated with air travel. But a desperate situation requires a drastic remedy: can Mr Colbourne suggest a more effective means of trying to stop airlines using JP-4 fuel?

Harpenden, Herts J. W. RICKARD

Montreal's New Airport

ON December 2, Sabena opened its Brussels - Mexico City service with Boeing 707 OO-SJE. The flight calls at Montreal, a Great Circle route with traffic rights which is only 14 miles farther (in 6,200 miles) than the direct crow's flight distance.

Montreal's new airport at Dorval was opened on December 1, and OO-SJE was the first Sabena flight—and the first Boeing—to transit the place. The kindest and warmest comments one can make about the new Dorval is that it is unfriendly in atmosphere and inefficient in action.

Transit is scarcely understood, involving the traversal of fully one mile of garish, brick-lined corridors which no prisoner could tolerate for long in his gaol, to reach a woman medical officer who checks vaccination certificates.

The actual main concourse has its brighter features, but the grim corridors and garish lighting make the whole aspect of Dorval an unattractive one. A passenger coming from even the most closely parked plane in transit must cover two miles on foot in the 45 minutes allowed (be it the small hours of the morning), and with the queue to file past inspecting authorities there is no time to reach the coffee shop before recall.

When the Sabena Boeing left for Mexico, its two covered gangways, fore and aft, carried different destination boards. The so-called "electric destination indicators," a vaunted efficiency measure, pointed out that 1st class passengers in the front of the plane were joining TCA flight 667 to London, while tourist class at the rear were entering Sabena flight 555 to Mexico!

Montreal Dorval, close to the famous city of IATA and spiritual home of so many airlines, has only succeeded in being a larger, brasher copy of American major airports, and so far it lacks the efficiency of operation which makes them work so well.

London SE25 K. WESTCOTT JONES

Living History

IN your Correspondence column of May 2, 1952, a letter appeared headed "Living History," in which it was pointed out that the Imperial War Museum Spitfire R6915 was (and for that matter still is) wrongly camouflaged.

Spitfire R6915 in its true camouflage scheme (see "Living History")

This letter led to quite an intensive search on behalf of the museum, but it was not until a few weeks ago that the final facts were resolved. It was then that contact was made with Flt Lt Hanson, who was responsible for the maintenance of this aircraft during the Battle of Britain.

He was able to supply the unknown code letter, and, together with records already known, his records made it possible to identify the camouflage pattern, the style and disposition of the lettering, and other important details.

Armed with these facts, I have made a drawing, a photo of which is enclosed [reproduced herewith.—Ed.] showing R6915 as it is now known to have been at that period.

As no known photograph of this aircraft when it was with 609 Sqn exists, I hope you will find the drawing sufficiently interesting to publish, thus making a permanent record of these facts.

Radlett, Herts C. RUPERT MOORE, ARCA

T. E. Lawrence and His Friends

From Air Marshal Sir Gerald E. Gibbs, KBE, CIE, MC

WITH reference to the photograph on page 955 of your issue of December 16, I wonder if your caption is right in describing the bearded figure as King Feisal? To me it looks like Abdullah.

London W1 G. E. GIBBS

THE picture of Lawrence of Arabia and group sent by Mr Leslie Hunt [Correspondence, December 16] was most interesting, but I think your caption is incorrect. King Feisal appears to be the tall gentleman in European garb, with helmet. The bearded figure is Abdullah, later Emir Abdullah of Jordan.

As a regular reader I would like to take this opportunity to express my appreciation of your paper, which is always full of interest for aviation enthusiasts.

London SW12 J. C. YOUNG

Renfrew Replacement

THE letter from Mr J. F. Foss in *Flight* for December 16, 1960, is based on the assumption that domestic (short-haul, European—call it what you will) and transatlantic (long-haul) traffic can be operated from the same airstrip. This is asking for troub'e—not necessarily accidents, but it is evident that long-haul traffic will completely block short-haul traffic during take-offs and landings, thus causing holdups in the domestic flow (*vide* BEA, etc, move to Gatwick). Moreover, who wants to set out from London/Paris/Munich for Glasgow and be faced with a 38-mile train journey from Prestwick to Glasgow (30½ miles by road, but it will take one hour)?

The railways discovered a hundred years ago that long-distance high-speed traffic will not mix with shorter-distance "stopping" traffic, so they built two lines side-by-side in each direction.

The present trend in aviation is for long-haul take-off and landing lengths (and times) to increase due to the cry for supersonic speeds, and for short-haul TOL lengths (and times) to decrease as a result of the plea for a smaller-mesh network with touchdowns at smaller aerodromes. (Note the efforts on VTOL, STOL and helicoption.)

Anyhow, after travelling along this railway from Prestwick for 29 miles the line passes within 1,800vd of Abbotsinch, and Abbotsinch is within 900vd of the Greenock/Glasgow line. Abbotsinch is nine miles from the centre of Glasgow by rail and nine miles by either of two roads—one of which, the Renfrew road, takes 16 minutes, the other 20 minutes (duly observing speed limits, traffic lights, etc).

Judging it solely from the domestic traffic utilization aspect, Prestwick's potential, considering a radius of ten miles, is 140,000 people. This area includes two small shipyards. There is hardly any other manufacturing industry of note. The area is mainly agricultural.

Abbotsinch's potential, considering a radius of five miles *and excluding Glasgow*, is 400,000 people. This area includes ten

CORRESPONDENCE . . .

major shipyards, two industrial estates, numerous large factories for automobile components, textiles, auxiliary machinery, prime-movers, and not forgetting Rolls-Royce aero-engines. The sales and technical representatives of the shipyard industry alone are forever running to London and the Continent where the ship-owners live. If one cares to include Port Glasgow and Greenock (16 to 18 minutes distant by road) there are another half-dozen shipyards and engine-builders available. There is also an active transatlantic shipping terminal which is expanding rapidly.

Fog? Renfrew is hard up against the north-east corner of Paisley. There is practically nothing south-west of Abbotsinch. The prevailing wind in these parts is south-west. Geographically Abbotsinch can have a runway longer than Prestwick's 9,800ft—but should we have high-speed, long-run aircraft near large centres of population, from the safety point of view?

That's the story from a logical and factual viewpoint, but thinking personally and selfishly I would rather the lot went to Prestwick, then perhaps Glasgow and district would get a club airport for sporting flying.

Glasgow S4 J. D. GILLIES

HOW heartily I agree with Mr Foss regarding the Abbotsinch decision. What is so sad about this business is the obvious prejudice of BEA and the Scottish Advisory Council against Prestwick. The argument continually put up by the former against the use of Prestwick as Glasgow's airport now holds even less water than before. With the completion of the new terminal and projected rail station it will be possible to reach Glasgow in between 35 and 45 minutes. It will take at least 35 minutes to reach Abbotsinch. For this small penalty consider the economics effected and the considerable improvement in service to the traveller—not to mention the fact that Prestwick is obviously a much better airport! One cannot understand the MoA decision when seen against the continuing deficits incurred by the country's airports.

It seems that BEA's policy is to centralize on London, merely feeding passengers to international services there rather than providing reasonable international services from other parts of Britain.

The Scottish Council's main job appears to be the carrying out of BEA's policy rather than the furthering of aviation in Scotland. However, there is still time; in the interests of everyone, let good sense prevail!

Glasgow DUGALD CAMERON

The Airliner that Never Was

YOUR fascinating leader editorial in the issue of December 16 ["The First Round"] outlines what is tantamount to a charge of plagiarism in design—but I think I am legally correct in saying there is no copyright in an idea. Since a design is surely an idea on paper, and since anyway two or more people might for logical technical reasons arrive at the same idea, can a case for plagiarism legally stand?

Whilst awaiting the verdict of some legal expert, may I recall the case of the Fairey F.C.1, the commercial airliner that never was because the outbreak of war in 1939 abruptly ended its promising career when it had reached only mock-up stage. *There* was an aircraft packed with ideas—and who can say in detail how many of those ideas found their way into the Lockheed Constellation which so closely resembled the F.C.1 in external design?

The F.C.1. could have changed the whole course of British civil airliner development. But the Government of 1945 had no vision and no courage, for when Fairey offered to build 200 in double-quick time using (in September and October 1945) war production lines that were rapidly being dispersed and re-aligned to day-to-day affairs, the Ministry of Civil Aviation just larfed and larfed at such a bizarre idea, and offered to sponsor one F.C.1. with (then) modern engines in place of the original Taurus. The firm fought hard, and eventually the Ministry raised the ante to (I think) three prototypes and two breakdowns—but by this time the labour force had dispersed and the golden opportunity was lost for ever.

London SW1 B. J. HURREN

FORTHCOMING EVENTS

Jan. 6-7. RAeS (joint meeting with College of Aeronautics and BIS at Cranfield): Rocket Propulsion Symposium.
Jan. 9. RAeS Historical Group: "Rebuilding and Flying Historic Aeroplanes," by Air Cdre A. H. Wheeler.
Jan. 11. BritIRE (South Wales Section): "The Measurement of Ionizing Radiation," by R. G. Wood.
Jan. 11. BritIRE (West Midlands Section): "An Equipment for Automatically Processing Time-multiplexed Telemetry Data," by N. Purnell and T. T. Walters.
Jan. 12. RAeS: "The Law and Science in Aeronautics," by H. Caplan.
Jan. 12. Institute of Metals: "Metallurgical Research at High Pressures," by Dr J. E. Hilliard.
Jan. 13. RAeS Rotorcraft Section: a.g.m. and "Certification of Civil Transport Rotorcraft with Particular Reference to Multi-engines," by H. E. Le Sueur.
Jan. 13. Society of Instrument Technology (Midland Section): "Controls Associated with Flying," by Capt A. M. A. Majendie.
Jan. 16-20. Institute of Physics and The Physical Society: Annual Exhibition (Jan. 19—Lecture: "Some Physical Problems in Travelling at Supersonic Speed," by Dr F. P. Bowden).
Jan. 18. RAeS Agricultural Aviation Group: "Locust Control from the Air," by Dr R. C. Rainey.
Jan. 18. BritIRE (Merseyside Section): "Microminiaturization," by H. G. Manfield.

RAeS Branch Fixtures (to Jan. 13): Jan. 10, *Luton*, "Supersonic Transport," by R. G. Thorne. Jan. 11, *Bristol*, "Gliding," by A. H. Yates; *London Airport*, "New Horizons for Forgings," by E. T. Stewart-Jones; *Southend*, "MATS Operations," by USAF Air Transport Wing staff member. Jan. 12, *Cheltenham*, "Some Mechanical Design Aspects of the Civil Avon," by F. W. Morley.

THE INDUSTRY

The Bigger Top

SAYING "there is more room at the top now than ever before, because the top is bigger than it has ever been," Mr W. J. Taylor, MP, Under-Secretary of State for Air, stressed the value of apprenticeships when he presented annual prizes to Handley Page apprentices recently. "The end of an apprenticeship is not an end—it is a beginning," he said. "It is a point beyond which you will be able to accept greater responsibility." To the apprentice members of his audience he said: "Remember your apprenticeship under Sir Frederick Handley Page as a privilege about which you will be able to talk with pride."

Sir Frederick himself referred nostalgically to summer evenings when he was studying as a young man, which "had tempted him to miss an occasional session," adding: "Perhaps it is no use my preaching the gospel as I was one of the worst sinners; but apprentices must realize that they can never get back the years which have passed." Dr J. S. Tait, principal of Northampton College of Advanced Technology, paid tribute to the Handley Page "enlightened policy of apprenticeships" and said there was now closer liaison than ever between industry and colleges.

Recorder at Ronaldsway

LAST month the first of the new transistorized Thermionic Products Series III tape recorders was formally inaugurated at Ronaldsway Airport, Isle of Man. This installation has two bays capable of 24hr operation recording eight channels, with time-base and automatic spare emergency channel, all on ½in-wide tape. The recording heads have been made compatible with the MoA's northern area equipment and full playback facilities are provided in each bay for use when it is on stand-by. Three channels may be reproduced simultaneously, if required. The ten-track system is capable of being modified for wider tape and 20 tracks.

IN BRIEF

Westland Aircraft Ltd have announced "with regret" that the Hon H. N. M. Grenville, OBE, has resigned from the board on his retirement from business at the end of last year.

No 216 of the *Technical Notes* published by CIBA (A.R.L.) Ltd, Duxford, Cambs, deal with bonded helicopter blades and provide an illustrated description of Redux bonding in the Sud-Aviation Alouette 3.

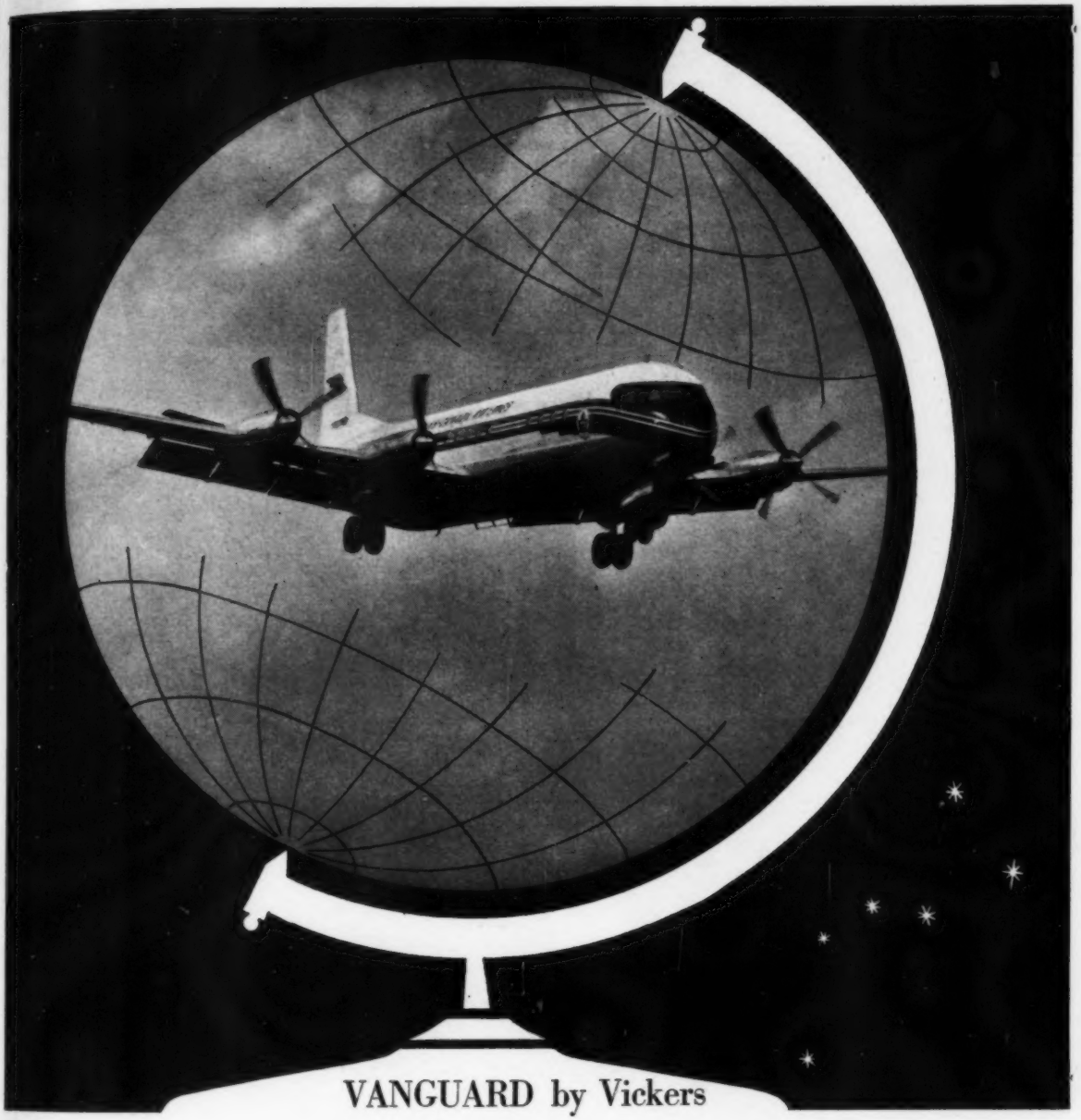
Mr R. M. Lustig has joined Racal Engineering Ltd as officer in charge of the company's publicity department. He was formerly with Ernest Turner Electrical Instruments Ltd.

Three appointments have been announced by Lansing Bagnall Ltd. Mr Allan Potter has been made general sales manager, Mr E. H. Wheeler export sales manager and Mr C. A. Barr manager of the company's technical services division.

Mr Arthur Jopling, deputy chairman of Blackburn Aircraft Ltd, recently presented gold watches for 42 years' continuous service to Miss E. E. Tempie, secretary to the production engineer, and Mr S. J. Gower, tool room chargehand. Both recipients started work with Mr Robert Blackburn at the Leeds factory before transferring to Brough.

All employees of the Goodyear Tyre & Rubber Co (Great Britain) Ltd have been advised of the company's decision to participate in the national graduated pension scheme. When combined with the existing Goodyear pension trust fund, this will have the effect of virtually doubling the pension benefits for all employees. It is estimated that the cost to the company will be £40,000 per year.

International Rectifier Co (Gt Britain) Ltd, Hurst Green, Oxted, Surrey, announce that the inspection department at their Oxted factory has recently been approved for the release of products to MoA and ARB standards. Two of the company's recent bulletins on silicon cartridge rectifiers (SR-226 and SR-227-A) describe respectively the stud-mounted 1,500 peak inverse voltage 300mA unit and ceramic devices ranging from 2 to 12½kV and 100mA.



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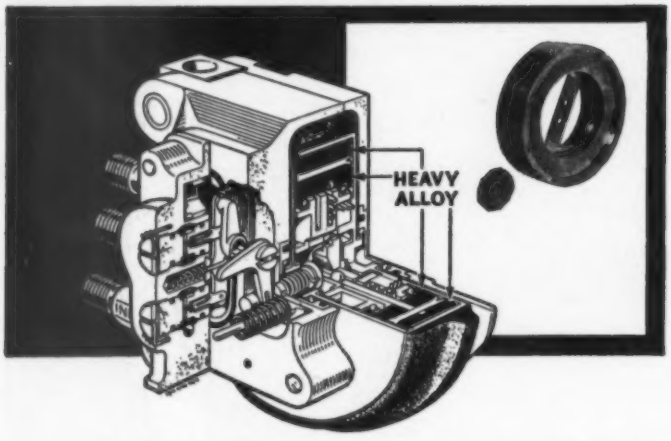

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The inset illustration shows one of the heavy alloy flywheels for the Maxaret automatic brake control unit. Its size can be judged by comparison with the 3d piece.

For comprehensive information on the use of G.E.C. heavy alloy, send for publication No. 4986, 1960.

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Boeing 707 powered by Rolls-Royce Conway Engines—photograph by courtesy of B.O.A.C

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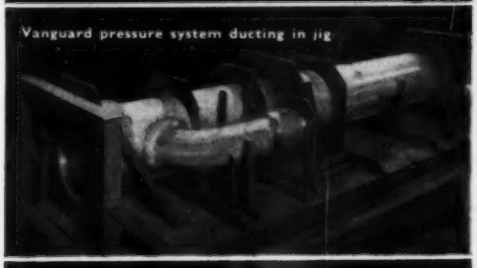
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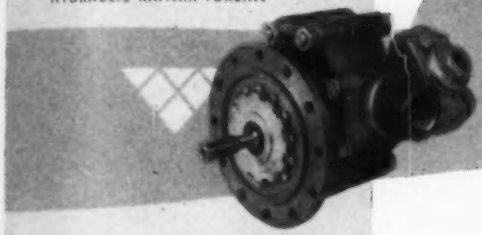

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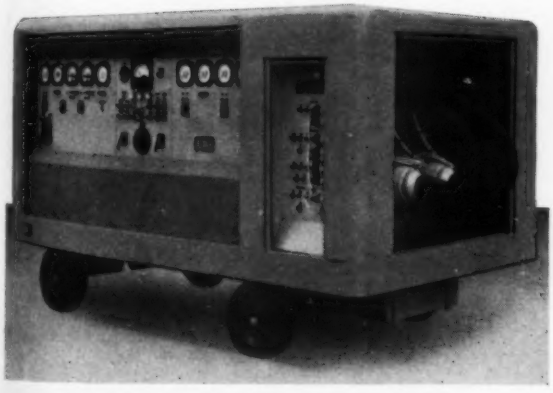

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